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GAS LIGHT JOURNAL

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CONTENTS.

An Asterisk (*) denotes an illustrated article.

OFFICIAL NOTICES—
New England Association of Gas Engineers..... 137
Fifth Annual Meeting Ohio Gas Light Association..... 137
EDITORIALS—
The Proctor Gas Process Properly Catalogued..... 138
This Time it is the Candle Power of Incandescence Electric Lamps 138
Some Recent Developments in Artificial Illumination, by President Henry Morton..... 139
*Experience with the Ross Charger, by M. S. Greenough..... 141
*A Review of Patents Invented and Inventions Patented in the Gas Interest the Past Year (Fifth Article), by F. Egner..... 142
*Coke Breaker for Small Gas Works..... 143
Influence of the Different Artificial Lights..... 144
The Petroleum Industry of Canada..... 144
ITEMS OF INTEREST FROM VARIOUS LOCALITIES..... 145
Mr. Fitch Buys another Gas Company—Gas Company for Rich Hill, Mo.—Annual Meeting, Charlestown, Mass.—Annual Meeting, Keene, N. H.—Hints from Houston, Texas—Annual Meeting, Jackson, Tenn.—Annual Meeting, Belfast, Me.—Annual Report of the Massachusetts Gas Commission—Miss Proctor's Gas—A Mexican Syndicate—Mr. Watkins in a New Role—Ald. Wetherell, of Chicago, as an Experimenter—Gen. Hickenlooper's Advice to Local Architects—Manager Fay Brings Suit—A Queer Suit—Death of Mr. C. C. Bills, Waltham, Mass.—Annual Meeting, Savannah, Ga.—Changes at Aurora, Ills.—Cheaper Gas for Monmouth, Ills.—Candle Power vs. Horse Power, Lincoln, Neb.—One Way to Appraise Cost of Public Lighting—St. Louis Wants a Municipal Works—Public Lighting, Brooklyn, N. Y.
Testing Foundations..... 148
The Market for Gas Securities..... 149

[OFFICIAL NOTICE.]

New England Association of Gas Engineers.

BIRMINGHAM, CONN., January 31, 1889.

The annual meeting of the New England Association of Gas Engineers will be held at Youngs' Hotel, Boston, on Wednesday and Thursday, February 20 and 21, 1889. The meeting will be called to order on Wednesday, at 10 o'clock A.M., by the President, Hon. A. M. Norton.

At one of the meetings a lecture will be delivered on the "Composition of Boston Gas," by Dr. Lewis M. Norton, of the Massachusetts Institute of Technology. From Dr. Norton's known position as a scientist, and his ability as a speaker, it can be assumed without question that the Association will listen to an interesting lecture.

The following papers have been promised:

"The Springer Process," by H. S. Chase.

"Incidents in the Life of a Superintendent of a Small Gas Works," by A. F. Cooper.

"Use of Lima Oil for Enriching Gas," by J. L. Hallett.

"Elements of Gas Analysis," by E. C. Jones.

"Artistic Articles Used in Connection with Artificial Lighting," by R. J. Monks.

"Photometric Standards" (Report of Committee), by C. F. Prichard.

"Gas and Electricity," by S. G. Stiness.

I think that the members will agree with me that the lecture and the papers named above will make the literary part of our meeting a great success. No member of the Association and no man actively connected with the gas business in New England can afford to be absent, if it is possible for him to be present.

Persons eligible for membership, either as active or associate members, and wishing to join the Association, will please send their names to the Secretary at once, who will immediately forward them blank forms of application.

Any member of the Association wishing to have any particular subject discussed will please notify the Secretary, who will in turn notify the members of the Association of the same, so as to enable all to come prepared to discuss the subjects more intelligently than otherwise would be possible.

Members wishing friends invited to the meetings will please notify the Secretary. CHARLES H. NETTLETON, Secy.

[OFFICIAL NOTICE.]

Fifth Annual Meeting Ohio Gas Light Association.

OFFICE OF SECRETARY,
COLUMBUS, O., January 15, 1889.

To Members of the Ohio Gas Light Association: The Fifth Annual Meeting of this Association will be held at Mansfield, Ohio, March 20 and 21, 1889.

All members are urged to begin now to make arrangements for attending this meeting; and all persons eligible for membership, who have not already joined the Association, are earnestly invited to meet with us at Mansfield and become members. No live gas company in the State can afford not to be represented at the meetings of the Association; and if any company should fail to appreciate this fact, its active superintendent or manager, and, in fact, every man who expects to earn his daily bread in the gas industry, can afford to attend the meetings at his own expense. Our membership now numbers 125, and our meetings are well attended. While it is, as yet, too early to make any definite announcements as to the Mansfield meeting, preparations are progressing satisfactorily, and it no doubt will compare favorably with the meetings heretofore held.

On December 19, 1888, the Secretary issued a circular to each of the 125 members, inclosing a self-addressed and stamped envelope for reply, requesting volunteer papers for the forthcoming meeting. Up to the present time, I have received but 46 responses, only one of which contained even a conditional promise to furnish a paper. As the success of the meeting, of course, depends upon our having a sufficient number of

papers, it is hoped that those members who have not yet responded will do so, and that those who have, will reconsider the matter, and that all who possibly can will volunteer papers before being "drafted" by the Executive Committee.

Several members are considerably in arrears with their dues. This may be owing, in some instances, to their desire to withdraw from the Association. If there be any such, I would be pleased to receive a written notice to that effect *at once*, as required by the Constitution, in order that the necessary action may be taken by the Executive Committee.

If any death has occurred in our membership since our last meeting, I would esteem it a favor to be so notified by any member having knowledge of the fact.

I shall be pleased to furnish any member, or person seeking to become a member, with a copy of our Constitution, on application.

Respectfully,

IRVIN BUTTERWORTH, Secy.

THE PROCTOR GAS PROCESS PROPERLY CATALOGUED.

Last Wednesday, through the kind offices of a correspondent, we received a copy of the Defiance *Daily Crescent*, dated January 22, which contained a lengthy and ludicrous account of a trial run with the Proctor system of gas making at the works of the Defiance Gas Company. The affair as detailed was so grotesquely absurd that we did not suppose any gas man would do other than laugh at it, and with that understanding an item respecting the "run" was prepared for publication in this issue. It seems, however, that those who are interested in "developing" the process (we here give them a free advertisement, in the full knowledge that it is about the best way to checkmate them), under the corporate title of the "Omega Gas Trust," with offices at No. 175 Dearborn street, rooms 46 and 47, are not amateurs in the line of making the most of an "opportunity," the latter being carefully prepared for in advance by themselves. It undoubtedly was a shrewd scheme to induce a prominent gas engineer (Mr. Forstall) and an equally prominent and decidedly shrewd business man (Mr. Judson), both well known to the fraternity, to be present at the Defiance experiment; and it was subsequently not considered in any degree knavish by the Proctor party to spread broadcast a tissue of falsehoods respecting the unqualified indorsement by the gentlemen named of what the latter had witnessed at Defiance. Now, the gas engineer who read that those witnesses were willing to credit the Proctor scheme with efficiency and economy could be readily excused for wishing to investigate the same a little more closely, for that the tendency of the day is decidedly towards the substitution of gaseous for solid fuel is incontrovertible, hence the mails to Chicago were soon burdened with missives directed to the gentlemen who had been temporarily snared in the meshes of the Defiance net.

And this, again, brings to mind the fact that the daily press of the country is fast becoming a positive hindrance to the development of real progress in almost every branch of industry that calls for something more than mere rule of thumb for its successful conduct. Your ubiquitous young man, fresh from the assignment desk of his superior, blithely acknowledges his ability to, at a moment's notice, tackle any subject, and do it full justice "before our next goes to press," and his superior calmly orders the trash to be printed. Time may be trusted to either teach the young man that he is ignorant on certain matters, or to cause the reader of his vaporings to simply laugh at their absurdity. In the meantime, however, the mixture to which we are treated is at once humiliating and exasperating.

Messrs. Forstall and Judson, nevertheless are, in respect of the maltreatment of their opinions by the Omega Gas Trust, enabled by the injudicious use of their names to come out squarely on the Defiance humbug; and thus, even admitting that they have been placed temporarily in a false position before the fraternity, we are offered another illustration of the fact that out of evil good may come—they have suffered, but not in vain; for their experience will be of value to their fellows. Without further preface we herewith submit their deliberate opinions concerning the Proctor-Omega-Defiance humbug:

OFFICE OF CHICAGO GAS LIGHT AND COKE CO.,
CHICAGO, Jan. 29, 1889.

To the Editor AMERICAN GAS LIGHT JOURNAL:

Our attention has been called by a flood of letters from gas men all over the country to an article published in the *Daily Crescent*, of Defiance, Ohio, on January 19, purporting to describe a test of the so-called "Proctor Gas Process," in which it is asserted that the undersigned were profuse in their praise of the plant. The whole article is a tissue of falsehood. The simple facts are that, at great inconvenience to ourselves, we went to Defiance, by invitation, to investigate this new process without any idea of its features. We saw steam, oil and air introduced into a bench of heated retorts, and were told that each of the retorts contained an electrical battery, the energy of which decomposed the elements of the steam, oil and air, and recombined them into an illuminating gas of extraordinary candle power at a merely nominal cost. The whole apparatus was crudely put together, and there were no means by which the product could be measured or its candle power ascertained. Our opinion, based upon the heat of the retorts and the appearance of the flame of the burning product, was that the latter was simply carbureted air; and we expressed this opinion to the gentlemen interested in the process as courteously as possible.

As we have been so flagrantly misrepresented and in order to answer at once the numerous letters of inquiry which we are daily receiving, we shall add here, in justice to ourselves, that we consider the "Proctor Electrical Gas Process," a twin sister of the "Freund Electrical Sugar Refining Process," of Brooklyn, N. Y.

Yours truly,

CHAS. E. JUDSON,
THEO. FORSTALL.

THIS TIME IT IS THE CANDLE POWER OF INCANDESCENCE ELECTRIC LAMPS.

Last month we had occasion to call attention to the statement of a test, made by Prof. Stoddard, of Smith College, Northampton, Mass., concerning the actual candle power of the "nominal" 2,000-candle power arcs maintained in the public lighting of Springfield, and this month we are in position to mention something about the actual value of the 25-candle power incandescence lamps maintained in the public lighting of the borough of Conshohocken, Pa. The authorities of Conshohocken having in due season become impregnated with the belief that incandescence electric lamps were the illuminators that best represented the progress of the hour, and also furnished a broad avenue of escape from the "clutches of the gas company," accordingly entered into a contract for the supply and maintenance of not less than 100 incandescence electric lamps, each to have a guaranteed illuminating power of not less than 25 candles. The lights were to burn each night, were to be paid for at the rate of $1.75 each per month, the contract to live for 5 years from Jan. 1, 1888.

At the start all Conshohocken indulged in loud praise of the effectiveness of the new illuminator, and the latter acted fairly well during the summer months—not much attention was paid to it then—but when the bleak winds of autumn bared the trees, Conshohocken awoke to the fact that something was wrong with the lamps. The electricians stoutly asserted that everything was as it should be—in fact, they have one good quality, in a business sense, which never allows them to be other than right, as far as saying that they are right is concerned. Fair words, we are told, were never yet employed by a good cook, when the latter was attempting to make a parsnip palatable, and fair words finally failed to lull the suspicion of the Burgess of Conshohocken. This officer, in conjunction with his fellow trustees, eventually authorized Prof. Carl Hering (Phila.), who is a reputable engineer enjoying widespread fame for competency, to test the lighting value of the lamps, the authorization being accompanied by the stipulation that the lights "should be measured on several different evenings, and on the poles as they stand"—*i. e.*, without manipulation in a specially prepared room—"and be selected at random, or from different points; that the record should not be marred by effect from snow, moonlight, or other neighboring lights; and that the work should be carried out without the knowledge of the electric light company." The Professor carried out the agreement fully and conscientiously, as, indeed, it was certain that he would. His first essay was made on the evening of December 22d; these tests, however, being rejected by him, because he was not satisfied that the apparatus devised was in good shape. In passing, it might be said that 8 lamps were then tested, and but one came up to the contract standard. On January 8th 11 lamps were tried, with the following results: 11.75, 10.25, 12, 14.50, 13, 13.50, 10.50, 16, 8.50, 17.25 and 8.50 candles, respectively; or an average of about 12.33. The night was clear and moderately warm. On Jan. 14, under similar atmospheric and temperature conditions, 19 additional lamps were tested, and the illuminating values were found to vary between 33.50 candles and 6.75 candles, the mean of all being 15.25. Here was a pretty state of things, and the Borough plainly showed its disgust. At the next meeting of the Trustees Prof. Hering's report was read and its facts were discussed, the outcome being the passage of a resolution declaring the present contract void and the appointment of a committee to confer with the electricians on the subject of drawing up a new agreement—very tender treatment to mete to a defaulter. One great defect noted by Prof. Hering was the inequality of the carbon filaments, both in respect to length and thickness.

[Reported for the Society by the JOURNAL.]

Some Recent Developments in Artificial Illumination.

By PRESIDENT HENRY MORTON.

[On the evening of January 17 President Henry Morton delivered the following lecture before the Society of Gas Lighting, the lecture hall of the Stevens Institute, Hoboken, N. J., being the audience room. At the termination of the President's remarks the Society adjourned to the lecturer's residence, and there partook of his generous hospitality, the repast being served under an illumination in which the Welsbach incandescence mantles were conspicuous.—ED.]

On the evening of October 18th, 1878, in a lecture delivered before the American Gas Light Association at the Stevens Institute of Technology, I used the following words:

"While improvements will of course be made in the development of light from electricity, improvements are also being carried out in the production of light by the combustion of gas; and there is no reason in the nature of things why the improvement in the one direction should not keep up with that in the other."

Looked upon as a forecast or prediction this has not been fulfilled, but I still think it true that "there is no reason in the nature of things" why the improvements in illumination by gas should not keep pace with those in illumination by electricity. The reason why they have not done so is not in the nature of things, but in the nature of men.

In other words, while for the last ten years we have had most of the brightest minds of the world intent on the development of the electric light, and the means for producing it, very few have given their attention to the improvement of the gas light, or the methods for its production.

The result has been that while the electric lamp of to-day is between twice and three times as efficient as the electric lamp of 1878, the gas burner in all but universal use is identical with that in like use ten years ago, and, with one exception, no marked improvement has been reached in any of the proposed new burners which are seeking recognition and use by the public. At the very lecture to which I have above referred I exhibited a Sugg burner with which a consumption of 40 cubic feet of ordinary 16-candle gas gave a light of 250 candles, or 6¼ candles per cubic foot. This is an efficiency which, as far as I know, has not been very much surpassed by the Siemens-Lungren, or similar burners which are seeking introduction at the present time, unless it may be where very large volumes of gas are consumed in a single burner.

In what I have just said I am not intending to ignore or neglect what has been done in the direction of increasing the candle power of gas, or in cheapening its manufacture. Much thought and genius have been devoted to this problem, and many important improvements have been made within the last ten years; but this is not the point I have now in mind and wish to bring before you at the present time. What I wish you *now* to consider is the fact that now, just as ten years ago, in our ordinary gas burners, we are consuming 200 units of available energy to obtain one unit of such energy in the form of light, and this is just as true as before, even if we have contrived to produce this energy at half the former cost per unit.

The mere cheapening of gas, I contend, is not the only, or the scientific method of correcting the manifest wastefulness of our present method of using it to produce light. It would be equivalent to saying that to secure cheap fuel was the right way to improve the steam engine. In the case of gas such a policy, if persisted in, can only result in relegating gas to the cellar, the kitchen and the engine room, to warm us, to cook our food and drive our machinery; and in replacing it, as a means of illumination, by electricity, which may, it is true, owe its very existence and life to the enslaved labors of its deposed rival, imprisoned in the furnace of the steam engine, or laboring blindly in the closed cylinders of the gas engine.

I believe that gas, much as it has been abused, deserves a better fate, and will secure it, if anything like the attention is given to its education and refinement as an illuminating agency which has been lavished upon its impalpable rival, electricity.

I believe that a good beginning at least has been made in this direction by Dr. Auer von Welsback and those who have been developing and improving his very original invention; and it therefore gives me pleasure to bring before you this evening a number of the burners known by the name of Welsback, in the latest form to which the process of gradual improvement has brought them, and to point out to you what I have found by my own experience to be their actual merits or probable future advantages.

The problem presented to us when we seek the improvement of the gas burner is a most encouraging one, because the prospects of a satisfactory solution are so good.

Thus, in the first place, there is such an immense margin of profit or possibility of improvement. This I will now endeavor to point out by the following considerations:

In 1865 Prof. Julius Thomsen, of Copenhagen, showed that the mechanical equivalent of light was about 12.28 foot-pounds per minute, or 749 foot-pounds per hour for each candle. (*See Philosophical Magazine*, 1865, Vol. 30, p. 246.)

Mr. Moses G. Farmer, in a paper in the *American Journal of Science and Arts* (1866, Vol. 41, p. 214) showed as the result of certain experiments made in Boston with an electric light, that the mechanical equivalent of light was about 10.1 foot-pounds per minute for each candle.

This would give us an average of 11.29 foot-pounds per candle, or, for the sake of round numbers, say, 12 foot-pounds per candle per minute.

If a candle power per minute represents 12 foot-pounds, a candle power for an hour would be equal to 720 foot-pounds in the same time.

A cubic foot of our Hoboken gas (such as is burning here, for instance; and I speak of it because we have occasion to make analyses of it once in a while, and so I can make calculations on it from positive knowledge) gives about 640 heat units. That is to say, a cubic foot of it in burning would raise the temperature of 640 pounds of water 1° F. This multiplied by Joule's equivalent of 772 gives 493,080 foot-pounds; or, say, for round numbers, 500,000. That means that a cubic foot of this gas, in burning, gives out half a million foot-pounds of energy.

Now let us see how this compares with the amount of energy developed in the form of light by the same cubic foot of gas. This same Hoboken gas, burning in a standard Sugg burner so as to make it give 16 candles, will burn just exactly four cubic feet per hour. That gives an efficiency of four candles per cubic foot. Each cubic foot will therefore give us 4-candle power for an hour. Therefore each cubic foot so burned would, in an hour, give out light equal to 12 (the energy of one candle light) multiplied by 4 (because there would be 4 candles), multiplied by 60 (the number of minutes), which is equal to 2,880 foot-pounds, and this is the total energy of the light developed. While it is doing this or was giving out the 2,880 foot-pounds of light energy, it was at the same time giving out the half million foot-pounds as the total energy of combustion. The percentage of light energy to total energy would then be 0.586 per cent., or in round numbers, 0.6 per cent.

So we may say that with the ordinary Sugg burner, giving 16 candles while burning 4 cubic feet per hour, we are getting a light efficiency of 0.6 of one per cent. of the energy present in the gas burned.

This shows us that in this Sugg burner we are turning the available total energy into a particular kind of energy by a method which is enormously wasteful; and that, therefore, there is every probability that some change in the method, or some new invention, will improve this conversion to an equally great degree. And if it only economizes a little, if it gives us even but one per cent. instead of 0.6 of one per cent., it will be giving us an enormous advantage at once.

But, even with this terrible waste, when we are only getting 0.6 of one per cent. of energy as light, throwing almost all of the energy of the gas away, and only saving this fraction of a per cent., we still stand pretty well in the long run in comparison with electricity, as I shall show you presently when we come down to the final figures.

In the case of the incandescent electric light we find the following figures. Assume that practically you can get 10 lamps of 16 candles each for each horse power expended. (Some people will say that that is too much, and some will say that it is not quite good enough; but that it is not very far out of the way I think most people will admit.) This figure will make, for each horse power, 160 candles. Now, at 12 foot-pounds of energy per candle per minute, in the form of light, this would give us 1,920 foot-pounds of energy per minute, in the form of light, from these incandescent lamps. A horse power expresses 33,000 foot-pounds per minute. Comparing those numbers we get 5.812 per cent. of the total energy, developed as light, instead of 0.576 per cent., in the case of the gas burner.

In other words, in the electric lamp we have about 10 times as much of the total energy usefully converted into light as in the gas burner.

If, however, we go back to the coal as the source of the energy, then we are confronted at once with this other condition.

In the steam engines used for running electric light plants (and this is the result, not of mere guess, but of a number of measurements which have been made here by various members of our Faculty, on electric light plants), we utilize only about 5 per cent. of the energy of the coal used to produce the power applied to develop the electric current. It is true that there are engines that give 10 per cent., and perhaps there are some that give a little more—I think that 10 per cent. is very high, and is not practically reached at all in any such conditions as exist in engines running electric light plants—and I think that 5 per cent. is about

as much as we can depend upon. On the other hand, in gas making I think you will allow that there is not any greater waste in the production of gas from coal than 50 per cent., and, therefore, you get into the gas 50 per cent. of the energy of the coal.

From this you will see that there is here the same ratio (one to ten) between gas and electricity, only it is turned the other way. In order to turn the coal energy into motion (as in using the steam engine to drive an electric light plant) we throw away 95 per cent., and only utilize 5 per cent.; in order to turn coal into gas we throw away 50 per cent. and utilize the other 50 per cent. So that, getting 5 per cent. in the one case and 50 in the other, the proportion is as one to ten; and that brings the two systems to an equality again; for, starting with the coal, about as much of the total energy of the fuel is developed by the gas burner as by the electric lamp. Thus, starting with the coal pile, and considering merely the question of the conversion of coal into light, one process is about as wasteful as the other at present. I think this is a very encouraging thing to the gas makers. It shows us that, notwithstanding all the advantages that electricity has had by reason of its attracting the attention of the most ingenious minds of the world, and with all the ingenuity, thought and effort which have been devoted to it, the conditions are still so nearly equal in respect to developing energy from its crude source—the coal. I think it shows that if even a moderate amount of the same genius and effort was turned in the direction of developing light from gas, and in improving the agencies which effect this conversion, we might hope for something very good indeed.

I am aware that some who are connected with the electric lighting interest say that they do much better than what I have stated; but I have taken the trouble to inquire what any company believes any other company can do, and I find that they would all much rather guarantee an efficiency of 4 Watts per candle than anything better—if they knew that the guarantee was going to be enforced. In another comparison which I have made I have, therefore, taken 4 Watts per candle, because I find that to be the result of many tests. The Franklin Institute tests, made a few years ago, showed nearer 5 than 4 Watts for Mr. Edison's lamps. Suppose that we take 4 Watts as being not an unfair estimate of the practical efficiency of incandescent electric lamps on the average. There being 746 Watts to the electric horse power, this gives 186 candles to the horse power; and each candle representing 12 foot-pounds, we have $186 \times 12 = 2\,232$ foot pounds of light energy to the horse power; and $2,232 \div 33,000$ gives us 6 7 per cent. as the efficiency of the electric lamp on this basis. Which is not far from the 6.0 per cent. which we have already calculated from other data.

There is another point that it is important to notice. I have pointed out the advantages and the possibilities of the future with reference to the development of gas lighting, but I want also to draw your attention to some very important steps which have been made in electric lighting.

You will remember that when the subject first came up there were one or two serious drawbacks to the introduction of the electric light.

One was the enormous cost of distribution. The cost of laying pipes and keeping them in order was bad enough in the distribution of gas, but much worse in the case of electricity, when they have to lay what we may consider copper pipes, and incur other enormous expenses in that direction, especially for the incandescent system.

You are all familiar with the secondary system and its advantages, but I want to draw your attention to what you no doubt already know in a general way—the very considerable advances that are being made in that direction.

The use of secondary currents supplied by converters or transformers, enables us to use smaller wires in distributing, and then bring down the current to the requisite quantity and low pressure or electromotive force just where we want to use it.

The lights in this room are run by that system. The converter which operates them is on the wall. It will operate many more lights than are here; but it is the smallest converter that we could conveniently get. We have used it a good deal and at various times, and it works very nicely. It makes an easy way of carrying small light wires to wherever we need them, stringing them around in readiness for use, and then developing the current whenever we are ready for it and at any point desired.

Another obstacle in the way of introducing the electric light existed in the fact that, until some satisfactory method of measuring the electric current was discovered, there would be serious difficulty in making its use a commercial success. We all know what difficulty there was in introducing gas before the companies got to measuring it, when gas was sold at so much per light, and the consumers knew that they might burn an excessive amount without having to pay extra for it. The same difficulty has existed with regard to the electric light. The lamps have been put in and a contract price agreed upon, upon the assumption that they were to be used only a certain number of hours per day; and then they have been used two or three times as long. It has been a very difficult matter to control. It is only very recently that this requirement has been, as it seems to me, very satisfactorily met.

In the first place I will show you the Westinghouse meter which I have here on the wall. I will remove the case so that you can see it better. There is the whole apparatus, stripped. It consists of certain coils through which the alternating current passes. By adjusting the angle between the coils the amount of motion obtained can be regulated and arranged. These vanes encounter resistance from the air. If they move more rapidly they experience greater resistance. Therefore, by adjusting the size of the vanes and the position of the coils it is possible to regulate the motion of the registering parts of the device so as to correspond with the flow of the current. If the vanes move slowly they record a small flow of electricity; if very fast they record a rapid flow. That is, the rapidity of the motion is in proportion to the flow of the current. It is only necessary to connect the vanes with a train of wheel work, moving little hands on dials, and you have a meter as accurate as any ordinary gas meter. There is a little glass, in an opening in the case, through which you can see the vanes going around, and so, in a general way, judge whether it is running fast or slow. Then, through this other little window you can see the hands on the dial plate, and may in that way follow it from hour to hour, or day to day, and see just what the consumption is. The consumption of current may be indicated on the dial in whatever way is thought best. It may indicate lamp hours, or the equivalent of cubic feet of gas, or amperes, or anything else. For all practical purposes it seems to me that this instrument measures electricity exactly as the gas meter measures gas. Experiments have shown that this meter can be kept right within two per cent. This meter will measure 40 lights. I am not able to state its cost, but there is no reason why it should be more costly than a gas meter, as there is nothing about it to make it expensive. The train of wheels, if made in quantity, would cost very little. In addition to that there are this little metallic disc and the spindle. There is no machinery to move it, and no rubbing surfaces to make a connection. That is the very extraordinary part of it. It is a revelation in electrical machinery.

This meter is constructed on the principle of the motor which will very soon appear in the market—a motor to be run with alternating currents, and in which there are some remarkable peculiarities. There is an armature with its current closed on itself—that is, the wires of the armature come around so that the two ends meet, and there is no connection outside. Then there are coils outside of the armature through which the alternating current passes, and when the alternating current passes through this exterior circuit the armature rotates.

(*Query:* "Does it take any pressure from the current to drive it?")

It takes a minute quantity, of course, to do anything; but as a meter it is a very economical machine. As a motor it has an efficiency of 85 per cent., or thereabouts. In practice this machine takes no more from the current than a gas meter takes from the pressure of the gas.

(*Query:* "Suppose you drive that by a 40-light current, would not the resistance of the air make considerable difference?")

It would make a difference, of course; but the adjustment is so made that it will give a correct proportionate measurement. It is intended that there should be a little more resistance in the air at the time, and that helps to make the indications accurate. It takes a little more energy out of it when measuring a large current than for a small current; but that is proportioned all the way through, so that the registration keeps within 2 per cent. I am purposing to make a series of tests, so as to be able to see for myself just what it does; but I fully believe that what is told me about it is reliable, and that it really operates with that degree of accuracy.

In addition to that, I call your attention to another form of meter, which has been developed in this Institute, and which I think is very ingenious, and may meet another want in that direction. It has not the attractive characteristic of looking so much like a gas meter, and so it does not quite come home to our hearts as the other does; but still there may be cases where that fact would not be considered a great disadvantage.

The foundation principle of this meter is shown by the small object which I have in my hand. It consists of two pieces of German silver—a German silver wire and a strip of German silver. In the first place, this strip of German silver is, by a simple mechanical treatment, punched and cut in such a way that there are a vast number of equally placed little cuts right through the strip; and then the piece between two cuts is pushed one way, and the piece between the next two cuts is pushed the other way; and so the pieces are pushed alternately backward and forward, so that a wire can be run right through, like the warp and

weft in weaving. You have often seen a ribbon laced into a piece of trimming in this way, and just so is this small wire laced in and out. Here is a piece of insulated German silver wire that may be thus run through the sort of open tube which is made by cutting the strip, and pushing the parts alternately backward and forward, and if when it is so inserted pressure is brought upon the threaded strip, the whole is made tight and solid. That being done, one end of the wire is soldered to the strip at one of its ends. Then a current is passed up through the wire and down through the strip.

The heating effect of the current is next to nothing upon the broad strip, but is relatively great in the wire. The result is that the wire, expanding, but being held piece by piece all the way along by this strip which does not expand, causes it to curve or bend over, and so bend or curve a great ways. Now, any change of surrounding temperature (I mean any change of the temperature of the room) will have no effect upon this compound wire and strip, because it will affect both parts (wire and strip) equally. It may be exposed to a freezing mixture or to boiling water, yet remain perfectly straight; but if you pass a current through it, it will bend in proportion to the force of the current. It bends so much that, if you fasten one end, you will see the other end swing through a long arc.

We fasten the strip at one end, while the other end carries a little pencil or marking point. Beneath the point a disc of card or paper is rotated by clockwork. It may occupy a month, a week, or a day in rotating. As it rotates, of course, if the point stood still it would draw a circle upon the disc, and the diameter of the circle would depend upon the amount of current passing. If no current were passing it would draw this inner circle; if a great current were passing it would draw a circle far out here. According to the amount of current passing, it will draw circles at different distances. The result of this would be that when, from time to time, you looked at this rotating disc you would find marks which would indicate just what strength of current was passing at any one time; but when the whole thing was done it would require a little calculation, or the use of some instrument, to read from the card what it represented, and get the summation of the amount of current passing during any given period. Sometimes a great deal of current would be used, say, for one hour, and very little for another hour; and therefore it would require some work to integrate and determine what the aggregate amount was. It would not be a thing that you could read off at the mere inspection, as you can with the other meter; but there are many ways of making it quite easy to read it. In fact, there is now a plan under way by which the apparatus can be made self-integrating.

I draw your attention to this because it is an Institute affair, and I take a certain pride in it for that reason, and also because I think it a very ingenious device. By using a strip and a wire of the same metal joined in this way, you get rid of the effect of changes of temperature, a cause which has thus far been the great stumbling block in the use of a compound bar for such purposes. This instrument was devised by Professors Geyer and Bristol, who are working at it together.

I wish, also, to draw your attention to a few conveniences in connection with the use of gas, where we have gas and electricity joining hands and helping each other in contributing to the convenience, comfort, and safety of the public. I refer to the various gas burners which I have here, and which are intended to be lit by electricity. Here we have one arranged to light a candle. The gas is turned on, and then, by pulling this string, it is lit. This is a very nice arrangement for a chandelier. Here is another, simpler in form, but in which the same effect is practically produced. The gas is turned on by one movement, and while being turned on is lighted. Here we have one in which we turn on the gas, and then turn it off by a repetition of the same movement; now we want to light it again, and it is lighted. Of course, we never want to turn the gas out when it is already out, nor light it when it is already burning. If you do want to light it when it is burning, you simply put it out first; but if you are satisfied to put it out when burning, and not to light it when it is already lighted, then this apparatus will perform its functions directly and without complication. Then here is still another invention. You turn the stopcock on, and light the gas by the same action; you turn the stopcock off, and the light is extinguished, of course. I do not see anything new in that, but it is convenient, and it does its work. Here we have a similar thing applied to an argand burner, by which we can light it by simply turning the button; but that is not automatically lighted, nor automatically extinguished, for we have to turn the gas on and off. This lighting can not only be done close by, but it can be done at a distance. I have had a burner arranged at the other end of the room; by touching this button it is lighted; I touch another button and it is put out. This has been called the "Burglar's Comfort." When he comes into a house at night he may find the darkness very disagreeable, and perhaps inconvenient. There may be risk of encountering a neglected coal scuttle on the stairs. How delightful, therefore, when he has entered the house and begins to ascend the stairs, to have the gas lighted when he treads upon the first step, and thus save him from all painful and disagreeable accidents. Sometimes it is used for other purposes, as when one enters a room and by pressing a button at the door lights the gas, and does not have to grope around in the dark for the match box.

These automatic gas burners have been kindly furnished me by Mr. A. L. Bogart, of Union Square, New York.

(*Query:* "I understand that the main advantage claimed for the alternating current is the saving of expense; but do you not have to use one of the converters for every customer?")

Not for every customer. For example: An enormous plant is being put up near London at the present time. They have selected ground about seven miles out of London, where they can get the coal shoveled right out of the vessels into their yard, and so run their boilers in the most economical way. Now, for the number of lights which they expect to run (something like half a million or more), it would require a year's product of the world in copper to furnish conductors on the direct system. There would have to be cables as large as a barrel. But they propose to generate the current at an enormous potential, and use an electro-motive force of 10,000 volts. They will run it in that condition on a comparatively small wire—no larger than the ordinary arc light wire. Of course that will have to be very carefully insulated and enclosed. This current will be carried down to a central point in London, and there be converted, by one set of converters, down to 1,000 volts. This will be carried as a 1,000-volt current to the different houses, or groups of buildings, and there a converter such as *this* will bring the current down to 50 or 100 volts, as may be desirable. Of course (as the report with which you gentlemen are so familiar, and the rest of the world so ignorant, has shown you), there are many cases in which the distribution of electricity by this system is not advantageous. If the people using it are not within a moderate radius around the central station, there would be no object in using it. Its true efficiency will come in best where you can have the direct system for the immediate neighborhood, and then at a distance use the other system to overcome the loss and expense of conductors.

[A Paper read before the Society of Gas Lighting.]

Experience with the Ross Charger.

By M. S. GREENOUGH.

It is a common saying that in order to build a satisfactory dwelling a man must have tried previously to do so without entire success. In his second attempt he can avoid the drawbacks which he has found the first to contain. I cannot speak as to the truth of this, because I have never had anything to do with building a dwelling; but I should judge it might be, from our experience with our Commercial Point* retort house.

The efforts which have been made during the last few years to lessen the cost of coal gas have produced a considerable amount of new machinery, some of which has been a success, and some has not; and no company can insure itself against failure unless it always waits for others to make the experiments. If we had known as much five years ago as we know now—in other words, had our foresight been as good as our hindsight—we should have done three things, at any rate, differently.

First.—We should have built the house longer. The number of retorts on each side of it is not sufficient to utilize the capabilities of machine stokers. There are only 96 in line.

Second.—We did not allow room enough at each end of the house to permit either machine to so get out of the way of the other as to leave room at the one end to draw and at the other to charge all the retorts in the last fires.

Third.—The system which we adopted for mechanically breaking and raising the coal in the coal shed, transporting it into the retort house, and storing it in overhead bins, has had the effect, in actual use, of making so much fine dust as to seriously interfere with the satisfactory working of the benches under any system, and especially with the use of the Ross charger.

I mention these faults of design because estimates of what could be done elsewhere might be based upon our working, and it is only fair to the machinery to admit that it could handle 24 more retorts than we have in use. In fact, it could do even better than that, for, owing to the rea-

* Boston, Mass.

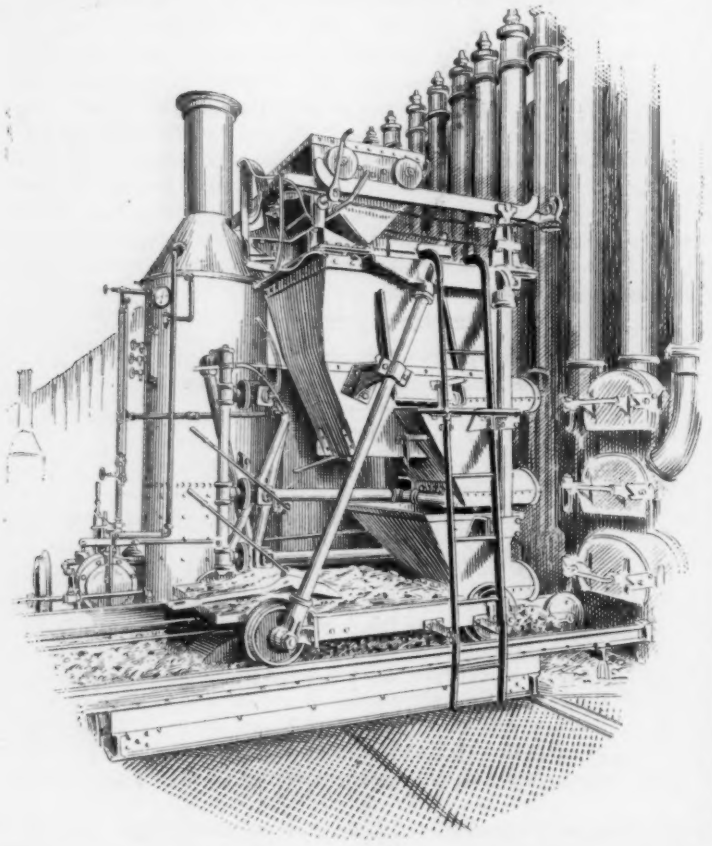
son mentioned, there are in one stack three retorts which we cannot draw, and which, with one other, we use for naphtha, and in the other stack six which we cannot charge, leaving only 86 actually charged by the machine, while its capacity I consider to be not less than 120 retorts with 4-hour charges.

The Ross drawing machine we have had in use continually, and its merits are so well known that it is unnecessary to dwell upon them. The charging machine, however, we have only introduced this autumn. To the merits and demerits of this I now call your attention.

The first question always asked is as to the evenness with which it lays the coal in the retort. To this I would say that we follow the machine with a leveler, and that, on the whole, while the coal will not lie quite as well as from a scoop, yet it does well enough to avoid any reasonable criticism.

The next question—as to pressure in standpipes—is uncalled for. There is no pressure at all.

The third—as to evenness in the weight of charges—is a very serious one. The coal which has been used in Cincinnati must run very even in size; for we were assured by General Hickenlooper of the comparatively small variation in weight which they had experienced, and figures were sent me, of experiments made under his direction, with which no fault could be found. It was not so with us, however. The bins were made to hold 325 lbs. apiece; but in actual use, filling them up, blowing them out and weighing the coal, it was seen that the amount would vary from as high as 400 lbs. to as low as 300 lbs. The natural result from this was irregularity of heats in the retorts, which in its turn was followed by stopped standpipes and trouble in the hydraulic main. It was, therefore, necessary to regulate this matter, and after some experiment a weighing



machine (see illustration) has been added to the top of the hopper, which greatly reduces the difficulty, though it is not perfectly accurate.

To work it requires a second man in the running of the machine. I regard its use, however, as practically almost indispensable to enable it to give satisfaction.

Now, as to the saving in labor. Leaving out the question of caring for furnaces, or handling, quenching and storing the coke, we had our labor on the retort house floor organized in two gangs, each of which took care of 48 retorts. Each gang contained three scoop men, who got the coal from the bins and put it, every four hours, into the retorts, one lid man and one floor man. These men could have worked 12 retorts more without difficulty, in my opinion; but one gang could not have worked the whole 96. There was also a man on the drawing machine who ran both stacks. Making 11 on a watch.

As at present organized the work is done by one man on drawing machine as before, two men on charging machine, one leveler and two lid men. This makes five men less on a watch, ten men for the 24 hours, or about $26 per day. Although ten per cent. ought to be allowed for wear and tear on the machine, and although it eats up about a ton and a-half of coke per day, yet the saving ought to very nearly pay for its cost in a year; besides which it does not strike nor grumble. It is very rapid in its work, charging the three retorts in about 15 seconds.

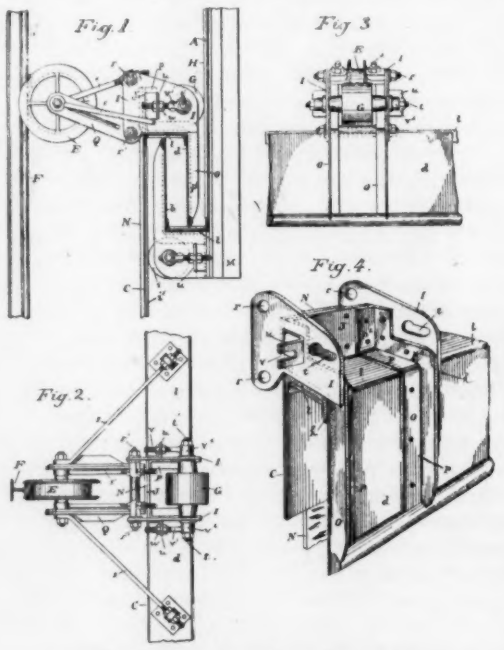
Taking everything into consideration, it certainly seems as if the question of machine stoking had come nearer a solution than it ever had before.

[Fifth Article.]

A Review of Patents Invented and Inventions Patented in the Gas Interest the Past Year.

By Frederic Egner.

The gasholder guide-wheel carriage herewith illustrated is the invention of our mutual friend, Mr. J. Frederick Mayer, for many years with



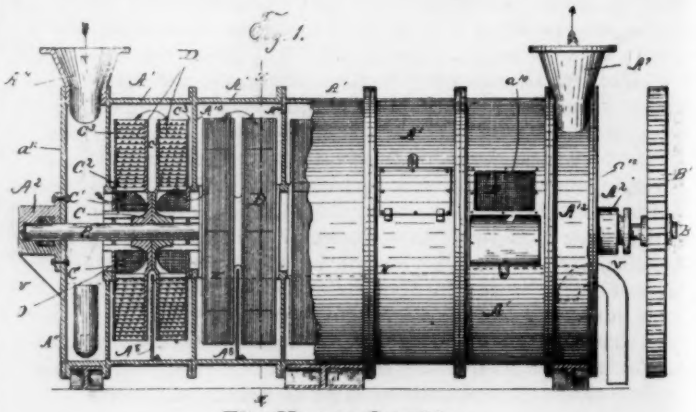
The Mayer Guide-Wheel Carriage.

Messrs. Bartlett & Hayward, of Baltimore, Md., as Consulting Engineer. We think the cuts need no explanation, as the advantage of the device over the ordinary method seems to be self-evident upon examination.

Patent No. 385,465 shows a device for producing gaseous fuel from oil, more particularly adapted to locomotives, and may, therefore, be passed by us in this paper.

Patent No. 388,474 shows us a condenser and tar separator, an apparatus which may be best described as appearing somewhat like one Mackenzie condenser above another in the same outer shell, and would seem to be a good apparatus for the purpose mentioned.

The gas scrubber patented by Mr. W. Morava is on the "Standard" washer-scrubber order; but instead of having thin metal discs between



The Morava Scrubbe .

which the gas passes, as obtains in the latter system, the Morava scrubber has wire wound upon suitable reels, which can be unwound separately for cleaning. In the cut we present a side elevation, partly in section and the outer casing removed, which will give a better idea of the machine. If it will do as well as the "Standard" scrubber it must be a very good machine indeed.

The inclined gas retort bench of A. Coze was described at the meeting of the Western Gas Association, May, 1888, an account of which will be found in these columns (see JOURNAL, June 16, 1888 p. 421). An experimental bench of that style has been in operation at the works of the St. Louis Gas Light Company, of St. Louis, Mo., for over a year, and is said to give complete satisfaction. It is still on trial, however. In due time the results may be made known. Gas engineers who have examined it have expressed themselves as greatly pleased with what they witnessed.

Patent No. 389,567 we can afford to pass over without special remarks; good gas can no doubt be made in the apparatus.

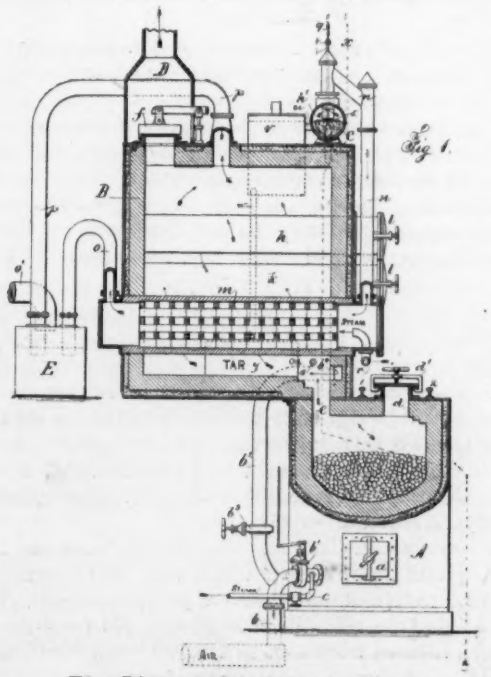
The retort furnace of W. R. Jones has been previously described in this JOURNAL in a letter from Ernest Schinrock, Esq., read at the 1887 meeting of the Western Gas Association by Mr. E. McMillin. (See JOURNAL, July 16, 1887, p. 36.) It seems to be a simple and good furnace, and applicable to all styles of retort benches.

Patent No. 389,785 is for another gas scrubber, by which the inventor seeks to accomplish what the "Standard" washer-scrubber does so well. These attempted imitations are the best kind of a recommendation for the "Standard."

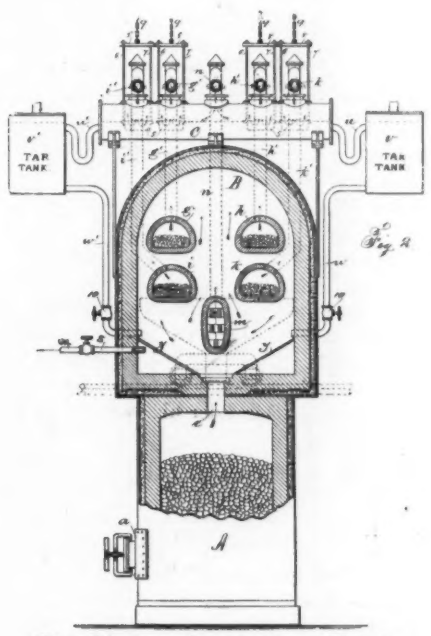
In patents Nos. 391,386 and 391,387 are described an apparatus and process in which there are a number of water gas generators and limestone chambers grouped around a central tubular boiler. Limestone, slag, or other porous material is *soaked* in petroleum, coal tar or other liquid hydrocarbon, which is then charged into the limestone chambers until these are about half filled. These chambers are then sealed airtight. At the same time the generator chambers are filled with coal or coke. A fire is then kindled and an air blast turned on. The products of combustion are then carried through the limestone chambers, heating them, and from there through the flues of the boiler to raise steam. When the coal is hot enough the air blast is turned off and steam turned on, and the steam is then decomposed and the resultant gas carbureted. When the fuel is no longer in proper condition the steam is turned off, the air blast turned on, and the operation previously described is repeated. The writer has, of course, an opinion about this process, but would prefer not to state it. Practical gas men are competent to form their own correct opinions in such matters.

Patents Nos. 392,553, 392,554 and 392,555 contain nothing especially startling to the gas interests of the country. We may say that good gas can no doubt be made in the apparatus covered by these patents, and that ought to be "enough said."

The following cuts represent an apparatus for the manufacture of gas, devised by Mr. H. M. Pierson, of Brooklyn, N. Y. Fig. 1 is a vertical section of the side elevation, and Fig. 2 a vertical cross section, at the line x, x, of Fig. 1 of the apparatus. In the specifications accompanying the patent the drawings are explained about as follows: A represents the generating furnace, which is of usual character, and in which there is an air-tight door, a, opening into the ash pit. An air blast pipe, b, with regulating gate, b^1, and a steam pipe, c, providing for the inlet of air and steam, a throat, d, and a gas-tight



The Pierson Apparatus.—Fig. 1.



The Pierson Apparatus.—Fig. 2.

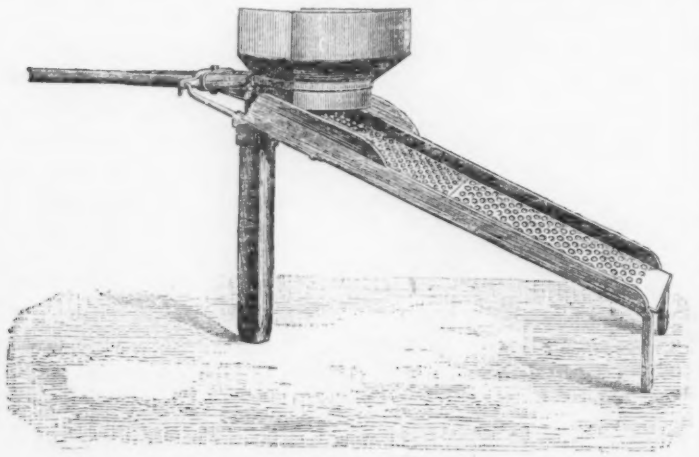
cover, d^1, to admit fuel. Above the generating chamber is shown a retort chamber, B, which is connected with A by the passage e. A chimney, D, with valve, f, serves to carry away the products of the first heating up. From air pipe, b, there is a branch air pipe, b^3, with valve, b^2, and terminating in the flue in front wall, to carry the air into the retort chamber at b^4. When A is being heated in the usual manner, the resultant gases are burned in B, by means of the additional air supply at b^4. The retorts, g, h, i, k, are for bituminous coal, like ordinary coal retorts, having mouthpieces and covers, l, l, ascension, bridge, and dip pipes, and a hydraulic main, with an unsealing device for the dips plainly indicated. The gas obtained from the coal by direct carbonization passes from the hydraulic main down pipe n through a retort filled with checker brick, m, out at the rear of same, through wash box, E, and pipe, o^1. Steam is also admitted to retort m, the object being to decompose the same by contact with the heated carbon vapors from the coal. The tar waste is run into the tanks shown in Fig. 2, and from these into the retort chamber, where the water gas made in A, from time to time, in passing through said chamber, is supposed to pick up the more volatile hydrocarbons, and carry same with it through pipe, p, to waste-box, E, and out, with the gas produced in the retorts. The heavy matter, which cannot so easily be converted into gas, would be burned during the periodical heating up process. An oil pipe, s, is also shown, by means of which the gas made can be carbureted to any desired degree. The apparatus looks very well on paper, although several of its features seem to have been previously brought out by the patents of C. M. Tessie du Motay, and the Baron Jerzmanowski.

Coke Breaker for Small Gas Works.

At the last Congress (held in Boulogne-sur-Mer) of the Societe Technique de l'Industrie du Gaz en France, M. Chevalet, in his usual clever style, presented a model and gave a description of a coke breaker adapted to the needs of a small gas works. The author introduced his communication by adverting to the fact that although the rotary and continuous movement descriptions of breakers were good and effective instruments, these were, nevertheless, because of their first cost and the expensiveness of keeping them in repair, added to the charges for power, whether supplied by a steam or a gas motor, inappropriate for small gas plants. He then explained that he had endeavored, in the machine to which he called their attention, to evolve a coke breaker so simple in its mechanism and operation that the smallest gas works would find it profitable to use it; indeed not only so, but that even ordinary households might not discover them amiss.

In the main this breaker is based on the machine first manufactured by Leroy & Chevalet, and exhibited by the latter at the Congress of

1879. It consists of steel knives revolving above a suitable screen, meshed so as to permit of the broken coke falling through. Instead, however, of the knives turning all one way, they are caused, by means of a horizontally-acting lever, to take on, so-to-speak, a pushing and pulling motion. The cutting receptacle consists of a triangular cast iron box, armed on each side with pointed knives placed horizontally. The bottom of the box is fitted with a cast iron sieve, the meshes being graded to the coke size desired. Beneath this box works a lever, supported by



an upright, which turns in the socket that forms the angle of the box. To the other arm of the lever is attached an iron handle (4½ to 6 feet in length), held in position by a washer and bolt. The arm of the lever that moves beneath the box carries the knives, which are double-edged. The sheet iron funnel to receive the coke is suitably placed. The whole device rests on a stout post firmly fixed in the ground, its rigidity also being assisted by the horizontal bars that sustain the platform.

In operation one movement of the lever admits the coke to the cutting box, and a "jerky" movement rotates the knives. The shock imparted results in the coke, now being caught between the knives, being broken and the coke passes over the sieve. When it is wished to separate the broken coke from the breeze it is necessary to employ an inclined sheet iron sieve placed beneath the coke cutter proper. It may be meshed with holes of varying diameters. To this sieve is imparted a certain motion through the medium of the lever, and each time that the machine arrives at the end of the run a shock is directed to the sieve by means of the angle blocks on which abut the bars that support the sieve—that is, the shock thus causes the coke to descend.

With this breaker (and but slight strain is caused to the knives) one can easily reduce from 10 to 12 hectoliters (27 to 32 bush.) of coke per hour. On coke breaking proper, and working with vigor, but one man is needed; and the work is not very severe. Having filled the hopper, he works the lever until the hopper is emptied, and then repeats the operation of recharging.

In operating the breaker M. Chevalet recommends, with true Provincial prudence, that the man employed be paid by the results secured—piece work, in fact; for he says that it is only in this manner that the machine can be run at its best.

Influence of the Different Artificial Lights.

In all industries pertaining to the decorative arts, and especially to the various branches of furniture, the study of colors and their relation to each other is of the greatest importance. In order to select the colors which harmonize together, it is not only necessary to observe mathematically correct laws which prescribe the employment of such a one color in the present of such another, but even to study carefully how the several tones of the same primary color behave, when placed side by side, to produce decorative effects. Chevreul's researches have opened the way in this respect, and the study of the complementary colors has become the basis of the tinctorial art. In this regard the work is now done methodically, and the progress made in the art industries is truly remarkable for the production of harmonious combinations of colors. An important part of this study has been almost entirely neglected, however. In fact, the composition of designs, the examination of the tone-giving effects, the contrasting of colors for any decorative work, are nearly exclusively done by daylight, and very little thought is given to the effect which will be obtained at night with a particular kind of artificial light, although it is just under such light that the whole of the decorative work will be seen most. Now, as the source of any artificial light has a color of its own, the aspect and relations of the colors are changed, and a tone which appeared to be combined with its neighbor in happy harmony by daylight, produces an unsightly effect at night under a new kind of light.

It is necessary, therefore, not only to harmonize colors by day, but to ascertain, moreover, whether they harmonize together in the artificial light in which they will be seen at night. We have for observations of this kind employed the method hereafter described, which is as inexpensive, as regards apparatus, as it is practical and rapid.

The apparatus consists of a rectangular wooden box, the inner sides of which are covered all around with plain black velvet, so as to obtain an absolute black in its interior. The colored samples of tissues, metals, woods, chinaware, etc., to be observed, are placed singly or in groups upon the bottom of the box at the far end opposite to the observer, and are looked at through an opening made in the parallel side at the rear end. The lighting apparatus (oil or a petroleum lamp, gas burner or candle) is placed inside the box, near this opening, but separated from it by a screen, which is also covered with black velvet; its glass chimney being enclosed in a tube which is set into the opening through which the observer looks into the box. Thus all other rays of light are prevented from penetrating into the box but those from the illuminating focus within; besides, the burner itself is blackened, not varnished, and throws its light only upon the objects under observation, through an opening which is small enough to avoid any kind of reflection. On the outside, on a level with those in the box, samples like those under observation, and others of nearly the same colors, are placed upon a background of black or dark neutral gray velvet, separated by strips of the same color as the background. Thus the impression obtained with daylight can immediately be compared with that given with artificial light.

The results naturally vary with every kind of artificial light, but the same effects can be practically considered as constantly produced in the same manner by two powerful classes of artificial sources of light, only with varying intensity in each class. The first comprises the Drummond light, the electric light produced by the voltaic arc apparatus, and that produced by the incandescent light apparatus. These different systems do not alter at all the relations of the colors among themselves, but give to every combination of colors a livelier or more subdued tone, according to the illuminating power of the apparatus; we may add, that with these different lights only variations of quantity come into play.

Different is the case of the systems of the second class, which we shall enumerate, like the first, according to the degree of brightness which they impart or which they leave to the majority of colors. These are: the oxyhydric gas, fine stearine candles, ordinary illuminating gas, rape oil, refined mineral oil, kerosene. With these kinds of light producers the colors are generally attenuated, seldom brightened, and often changed several degrees above or below their proper shade.

The Petroleum Industry of Canada.

The London *Journal* publishes some interesting information on this subject, based on official returns of the Board of Trade. It appears that the oil producing territory of Canada is situated in the county of Lambton, Ontario, the greatest number of producing wells being in and about the thriving town of Petrolia, at which place the refineries are located. Consul Farrar, of Port Sarnia, Ontario, says that as far as yet developed the paying wells are confined to a belt of land, 2 miles in width and 16 miles in length, situated about 15 miles east of Port Sarnia, and extending nearly parallel with St. Clair river. The oil territory is divided into two districts—namely, Petrolia and Oil Springs. The annual production of crude oil in Petrolia averages from 350,000 to 450,000 barrels, and the production at Oil Springs is placed at 150,000 to 200,000 barrels—making the total annual average production of crude oil 600,000 barrels for the entire region. There are 9 refineries in operation at Petrolia which, in connection with the wells and other works incident to this industry, give employment to about 3,000 men, sustaining a population of about 8,000 people. The total quantity of refined oil for illuminating purposes manufactured from the crude averages 250,000 barrels. The capital invested in the oil business is estimated at £572,000.

The oil producers of Canada have been obliged to develop a high degree of ingenuity and improvement upon every plan tending to lessen the cost of sinking wells and the expense of pumping the oil. They have so far succeeded that the cost of sinking wells 475 feet—the depth required—has been reduced from £600 to £100, including casing and pump complete; and the expense of pumping from £1 to about 1s. each well per day. If such were not the case, the oil industry could not be made

to pay, as the great majority of wells produce only from 3 to 10 barrels daily.

The following is a description of the methods of, and appliances for, drilling and working the wells. The surface or drift earth is bored with an augur to the rock (which ranges from 60 to 150 feet from the surface), and a 10-inch wooden tube driven down to the rock. The rock is then drilled with a 5-inch bore a depth of about 150 feet and iron casing driven down. This casing is intended to shut out the surface water, which, if admitted, would prevent the free secretion of the oil, and would, by coming into contact with sulphur deposits, produce "black water," which is very injurious to the iron tubing of the pumps. The buoyancy imparted to the tools and cable by the 300 or 400 feet of water is avoided, and the presence of oil is discovered at once by the solid tools or by escaping gas. The drilling is continued until oil is struck, and the well is then ready for the pump. This is an iron tube 1½ inches in diameter, and composed of various lengths, at the end of which is the working barrel resting upon a strainer or perforated iron tube to keep out obstructions. In the working barrel are two valves—one to take in and the other to let out; and the oil passing through the strainer is lifted by the pump to the surface. In early days it was necessary to provide an engine for each well; but now, by the improved "jerker" system, one engine will drive 20 or 30 pumps, or even more than that number. A wheel or circular horizontal table is connected with the engine by the elbow joint in such a manner that it is made to perform a quarter revolution and return to its former position. To this wheel is attached a number of "jerkers" or poles, usually made of white ash, 2 inches square, with iron connections, by which power is conveyed to a number of pumps extending over a large area, and working them all simultaneously. By this plan wells that would not otherwise pay running expenses are worked at a profit.

Crude oil is composed of hydrocarbons of different gravities and boiling points. In distillation these hydrocarbons separate and come off as follows: (1) Naphtha, which is too inflammable to be used as illuminating oil, and is sold chiefly to paint manufacturers, although it is also used in other industries; (2) illuminating oil; and (3) the oils too heavy for illuminating purposes. The lightest of the latter is sold to gas-works as gas oil. What remains after the paraffin wax is expressed is manufactured into lubricating oil, wood oils, vaseline, hair oils, etc. Consul Farrar says that, on account of the fact that thus far the refiners have not been able to remove the presence of sulphur and other impurities from Canadian oil, which causes a disagreeable odor when used for illuminating purposes, large quantities of refined oil are imported from the United States into Canada, as is shown by the fact that, notwithstanding the duty of 7½ cents per gallon, about 200,000 barrels of oil from the United States are used annually in Canada, retailing at 30 to 35 cents, as against Canadian oil at 15 to 20 cents per gallon. There are 3,200 oil wells in the districts of Petrolia and Oil Springs; and the total value of the output of petroleum and products in Canada for the year 1887 is estimated at £400,000.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

Mr. H. D. Fitch, of Louisville, Ky., having purchased a controlling interest in the gas works at Bowling Green, intends at once to rebuild the same on an enlarged scale. This purchase places Mr. Fitch in control of no less than five Kentucky gas companies, viz., those at Owensboro, Frankfort, Bowling Green, Hopkinsville and Shelbyville. He also has a large interest in the plants at Pulaski, Tenn., Knoxville, Tenn., Los Angeles, Cal., and Vicksburg, Miss. It would thus seem that fair trade in gas properties is after all better in the long run than the opposition tactics formerly pursued in the matter of wrecking similar properties.

President Morris, of the Louisville Gas Company, under the provisions of the new charter, invites stockholders to exchange their old stock for new shares. The par value of the new issue is $100, against $50 for the old.

The Franklin Gas Lamp Company, East St. Louis, Mo., has been incorporated by Messrs. Jno. McCargo, Theodore Brinkman and John Franklin. The objects are to sell and rent gas lamps. Capitalized in $25,000.

The New Britain (Conn.) Gas Company will institute a reduced schedule, to take effect from April 1st.

Chiefly through the efforts of Col. Irish, the Trustees of Rich Hill, Mo., have granted a franchise (to run 20 years) for a gas works, and the plant is to be constructed at once. The Shickle, Harrison & Howard Company, of St. Louis, will furnish the iron work, and Jas. A. Scott is to put up the buildings. The latter has already broken ground. Rich Hill is a post town of Bates county, Mo., and is located on an elevated plateau (about 800 feet above sea level) midway between the Marais des Cygnes and the Osage rivers. In 1880 Rich Hill had a population of 1,000; to-day it boasts of 6,000. Close to it (from 1 to 3 miles) is an abundant deposit of steam and gas coal of a good grade and easily worked. In fact the mining returns for 1887 show that the total coal shipments from this point amounted to 1,093,236 tons. Good brick clay abounds, and another important enterprise is zinc smelting. Several lines of railway enter the place, which is but 16 miles east of the Kansas State Line. The capitalists interested in the gas works venture ought to do well at this point.

At the annual meeting of the Charlestown (Mass.) Gas Light Company Messrs. J. F. Hunnewell, W. W. Wheildon, P. J. Stone, J. A. Sawtell, L. B. Hathorn, C. F. Byam and C. F. Lawrence were elected a Board of Directors. At the organization meeting Mr. J. F. Hunnewell was elected President, and Mr. G. B. Neal was chosen Clerk and Treasurer.

The Consolidated Gas Company, of Baltimore, has purchased a controlling interest in the Siemens-Lungren Gas Lamp Company of that city. The new management comprises Jas. A. Gary, W. W. Spence, Bernard Cahn, Wm. A. Fisher and A. B. Proal as Directors. Wm. A. Fisher is President.

The Municipal Gas Company, Albany, N. Y., has increased its dividend rate to 7 per cent. per annum, payable quarterly.

The Municipal Gas Commission, of the St. Louis (Mo.) Councils has been authorized "to prepare the form of advertisement to be inserted in local and Eastern papers calling for bids for the building of gas works in the city, to be leased or sold to the city." To us this seems like a huge joke.

An act to incorporate the Bristol (R. I.) Gas Company has been brought to the attention of the Legislature of that State.

At the annual meeting of the Keene (N. H.) Gas Light Company the following officers were chosen: President, J. H. Elliott; Treasurer, W. L. Mason; Directors, J. H. Elliott, J. R. Beal, A. T. Batchelder, C. J. Buffum, F. C. Faulkner, W. H. Elliot, and J. W. Dodge. The annual reports were very satisfactory to the stockholders.

The electric lighting annex to the plant of the East Albany Gas Light Company, Greenbush, N. Y., will soon be ready to operate.

The gas and electric light divisions of the new Stoughton (Mass.) Light and Power Company are about completed. The electric portion will be put in duty on or about February 5th, and it is expected that gas will be turned on a fortnight later. From the applications so far received, gas finds the greater favor with prospective patrons of the Company.

The water gas auxiliary plant constructed for the Philadelphia Municipal Gas Works is now in regular working order. Director Wagner and Chief Park are said to have expressed their satisfaction at the results so far obtained.

At a recent meeting of the Board of Directors of the Houston (Texas) Gas Light Company, it was ordered that the following schedule be advertised, the same to affect all gas consumed since the 1st inst.:

Monthly Consumption.	Net Rate per 1,000.
4,000 cu. ft. and over	$2.50
Under 4,000	3.00
For cooking, heating and power purposes	2.25

This is a move in the right direction, and is one that should be followed by every gas company in the State, where, candor compels us to say, the average gas rate is by far too high. The Houston Company supplies gas stoves at cost, and makes no charge for setting meters, a plan that has brought money to its treasury. The Company's output is constantly increasing. Among the improvements made on this plant the past summer we may note the installation of a No. III. Pelouze and Audouin condenser, and a new set of purifying boxes, 8 ft. x 8 ft. by 3 ft. 6 in.

At the annual meeting of the Citizens Gas Light Company, Jackson, Tenn., the following officers were chosen: Directors, Jno. L. Wisdom, Jno. H. Duke, N. S. White, Jno. Y. Keith, and Robt. A. Allison; President, Jno. Y. Keith; Vice-President, Jno. L. Wisdom; Treasurer, N. S. White; Secretary and Supt., A. Robertson.

At the annual meeting of the Belfast (Me.) Gas Company, a dividend of 4 per cent. was declared. The following officers were also chosen: Directors, W. B. Swan, A. A. Howes, N. F. Houston, C. B. Hazeltine, and Jno. H. Quimby; President, W. B. Swan; Secretary and Treasurer, Jno. H. Quimby; Supt., A. K. Pierce. During the progress of the meeting Superintendent Pierce was interrogated as to the effect exerted on the output through the introduction and use of electricity. He replied that the Belfast Company had been under his charge for 23 years, and that the greatest *pro rata* increase in gas consumption in any one month, compared with its fellow of the preceding year, was shown last December, when the increase exceeded the output of December, 1887, by 25 per cent. To complete the statement, the output for the stated month in 1887 had eclipsed any of its predecessors.

THE Fourth Annual Report of the Massachusetts Gas Commission has been presented to the State Legislature, and is now in the hands of the Public Printer. Through the courtesy of the Commission we are herewith permitted to publish the following summary of the report, which is as comprehensive and interesting as any that preceded it. From it we learn that there are at present 71 gas and 78 electric light companies under the supervision of the Board. During the year the Agawam Gas Company, West Springfield, capital $50,000, and the Lenox Gas and Electric Company, capital $30,000, have been incorporated under the general law. The Vineyard Haven Gas and Electric Company was chartered by special act, and the Lynn Gas Light Company and Lynn Electric Lighting Company have consolidated, under special act. No application for approval of increase of capital stock under chapter 427 of acts of 1887, has as yet been made by the Bay State Gas Company.

Seven companies have applied, under chapter 428 of the acts of 1888, for licenses to make and sell water gas. Hearings were assigned, and, pending decision, the Board investigated the use of water gas in New York, Brooklyn, Albany, Chicago, St. Louis and other cities, and diligently inquired into the comparative safety of coal and water gas. While this work is still in progress and before petitioners have finished their side, or the remonstrants been heard, the Board declares that it would be manifestly unjust to form ultimate opinions, and wholly improper to attempt to indicate at the present time what the final conclusion may be. The suggestion is made to the Legislature, however, that as a doubt exists as to the interpretation of the act in view of its requiring licenses to be issued when the Board can certify that the gas "can be used with safety," further legislation is advisable, though the Board suggests that it is impolitic and harmful to convey the impression that either coal gas or water gas is not dangerous. Both are dangerous. That the Board may be enabled to grant a license for making water gas, if upon the final consideration of the matter it shall deem it prudent to do so, it recommends that the act be modified by striking out the portion requiring a certificate as to safety, and expressly allowing the Board the power to insert in the license such terms and conditions as it shall deem prudent, and, at any time after due notice to a company, to revoke or change the license.

The aggregate receipts of all the gas companies for the year ending June 30 were $4,777,190.01, and the expenses, $3,327,910.84, leaving an apparent net profit on the gas business of $1,449,279.17. A surplus of $547,182.20 remained after paying dividends, etc. Five companies failed to earn expenses; nine others did not earn enough to declare a dividend, and four others paid part of their dividends from their surplus. The figures show that while electric lighting has decreased the receipts from street lights, it has not as yet reduced the receipts from sales of gas made through meters.

Twenty-seven companies reduced the price of gas during the year; 9 of them had also reduced in 1887, 11 in 1886, and 2 in both years. The average price to consumers of 23 companies making annually more than 30,000,000 feet, is $1.495 a 1,000 feet. The average price of the rest of the companies is $2.261. Reference is made to the Spencer experiment of selling a large quantity of gas at a low price, and the fear is expressed that owing to the limited number of inhabitants the Company may prove to be selling too low to afford a reasonable profit. A comparison is given of the companies in Cambridge, Lowell and Worcester for 10 years. In that time all have reduced the prices. Cambridge from $3 to $1.75, Lowell from $2 to $1.20, and Worcester from $2.85 to $1.50. The report dwells upon the factors entering into the price of gas, and reiterates very earnestly the suggestions of former reports in opposition to heavy capitalization, some of the evils of which are forcibly pointed out.

The report, as usual, contains a large number of carefully compiled tables, giving in concrete form the statistical information from all the companies supplied, to the Board. These show the assessed valuation of the companies to be $13,398,005, an increase of $381,647 over last year's valuation. Local taxes and State inspection charges amounting to $266,350.70 were paid, an average of 10.69 cents per 1,000 feet sold, an increase in the total amount over last year of $35,648.78, and of 53-100 of a cent per 1,000 feet of gas sold. Dividends of $939,697 were paid. The number of meters in use has increased 5,928, equal to 41,901 lights. The increase in mains was about 60 miles, 18 of which is due to companies which appear in the list for the first time. The other 42 miles is distributed among 49 companies, and 21 companies report no extension during the year. There has been no material increase in the number of gas stoves in use. During the year there was a decrease of 636 public gas lamps, and for two years, of 1,727 lamps, due entirely to the growth of electric street lighting. The tabular portion of the report, which involves a large amount of labor, is of great value to all interested in gas and electric lighting, and reflects great credit upon the compiler, Mr. Allen, Clerk of the Board.

Four electric light companies chartered in other States have during the year reorganized and received charters in this Commonwealth. The other foreign companies will, it is believed, adopt the same course. There are now 78 companies, against 56 in 1887. The form of annual return for these companies has been carefully prepared after much investigation, and it is believed will prove satisfactory.

The report summarizes the various hearings given during the year, in Chelsea, Holyoke, Newton, and other places. A chapter is devoted to the case of the Boston Electric Light Company, appellant, against A. W. Perry, who was authorized by the Boston Board of Aldermen to extend wires across Summer street to supply electric light to his tenants and to other customers in the neighborhood. The report discusses at length the numerous questions involved in the permission granted by the Aldermen. The territory in question was covered by the franchise granted the appellant, and it was found that under the statutes the right could not be given, and the order was annulled. The Board states that cases may arise where the refusal of a temporary right to cross a public street might be a hardship, and there may be no sufficient objection to granting such licenses in meritorious cases, and upon proper terms and conditions. If such shall be the judgment of the Legislature, adequate authority can readily be given. The Board also recommends that on an appeal from the Mayor and Aldermen or Selectmen, power be given the Board to annul the whole or part of a grant, and to modify its terms and conditions or prescribe others.

The report devotes a long paragraph to the New Bedford hearings, growing out of the petition for the consolidation of the Gas Company and the New Bedford Electric Light Company. The case was very carefully inquired into and the arguments for and against consolidation duly weighed. Neither the city nor the public took any part in the hearings. The remonstrant was the Edison Company, which supplied a limited area with incandescent lights. For consolidation it was urged that a saving could be made in operating expenses and better service given the public. The opponents argued that as they were the first to invest money in the enterprise of electric lighting they should be protected, and, further, that the Gas Company would use its surplus profits in supplying the electric lights at less than cost. Finally the Gas Company offered to buy the Edison plant at a price which would reimburse the stockholders adequately, and the offer was pending at the time the board granted the petition. The result has confirmed the wisdom of the consolidation. The output of gas has increased 10 per cent., and the electric lights from 154 full arcs to 195 full arcs and 18 half arcs. Meanwhile the Edison Company, which concluded not to sell, has increased from 3,800 to 5,700.

During the year there have been four cases of accident due to escaping gas, none of them fatal.

MISS PROCTOR'S GAS.—Great undoubtedly is Chicago, and greater still are her residents; for they will not rest content as imitators, but are ever seeking to be the only and original. This yearning for originality even pervades the gentler sex who adorn and leaven the throng of humanity in the great metropolis of the Central West, in proof whereof we relate the following narrative of what one Chicago female, within the brief span of two fleeting years, has accomplished in the line of gas invention. Our heroine is a Miss Hattie A. Proctor, the adopted daughter of Mr. T. G. Hall, a Chicago chemist, who is not unknown to gas men, either, as the patentee of a gas process that did not revolutionize existing methods of gas manufacture and distribution. His more than ward became an enthusiast in her more than guardian's researches, and the result of her labors is now to be seen in Defiance, Ohio, where the Defiance Gas Company—its proprietors were always given to the seeming practice of trying to make something out of nothing, with the displeasing but inevitable result that the trial was never a profitable one—has installed a Proc-

tor type of plant, which the inventor rather oddly insists shall be known as the "Omega Process." We are unfortunately obliged to imbibe our knowledge of the construction and operation of the Proctor-Omega system from the columns of the Defiance *Daily Crescent*, and rather than destroy an iota of its lucid description, we hereby repeat what the *Crescent* prints about it: "The generator in which the oil is transformed into gas resembles a large furnace, in the top of which are a number of pipes which extend the entire length of the furnace. At the rear of the furnace the pipes are run upwards through a cupola, thence into a large trough filled with water, where the gas is condensed. Oil, water and air are forced into the pipes in the furnace, and the three substances pass through the pipes. The pipes are subjected to a great heat, and the oil is transformed into gas. The gas passes through the pipes in the cupola, into the pipes surrounded by water, and is condensed. From here it passes into a separator, where the gas is separated from the sulphur and arsenic. From here it passes into the holder, and then into the city mains. The principal trouble which it was thought Miss Proctor would experience, and which gas experts said she could not obviate, was the carbonizing of the oil in the pipes; but Miss Proctor overcame this by inventing a chemical combination which is placed in the pipes, preventing the oil from carbonizing." In addition to this, we have merely to add that the first cost of the manufacturing plant is but a trifle—the Defiance sample, which is rated to produce about 2,000,000 cubic feet per day, cost less than $1,200—and that the gas can be produced (from oils of the "B. S" variety, at a price not to exceed 50 cents per bbl.) at a cost of 5 cents per 1,000. We are, however, not sure that the percentage recouped from the sale of the arsenic, secured in a free state during the operation of "separation," as mentioned above, is duly credited to the manufacture's account. If, not, why it is possible that Miss Proctor's gas is to all intents and purposes a bye-product; for arsenic is a staple article of commerce, and commands a ready sale at good prices! The *Crescent* intimates that the trial run made at the Defiance works on Jan. 19 was witnessed by Messrs. Judson (Consumers Gas Company) and Forstall (Chicago Gas Light and Coke Company), of Chicago, who pronounced the test a grand success. In fact, Mr. Judson is said to have exclaimed impulsively, "The Chicago companies will put them in at once," although we must confess that the sentence does not commit him very greatly to anything in particular. As other testimony worthy of substantiating the verdict of the eminent gas man above named, we note the *Crescent* quotes J. L. Scott, P.D. (the letters stand for "Practicing Dentist), on the Omega apparatus; his opinion being rendered thus: "I think the principle is there, and that is of course the only thing of consequence." Toots? As this may be said to be the alpha introduction of the Proctor gas to the notice of the general fraternity, we hope soon to be called on to write omega in respect to it.

Mr. Chas. J. Whimple is on a visit to the United States with the object of enlisting American capital to further the objects for which the Union Light, Fuel, and Gas Company, of Mexico, was chartered. This concern is said to have received an exclusive franchise (to run for 20 years) for the right to supply light and gaseous fuel to the public buildings and communities of Mexico. The Company is capitalized in $5,000,000, and proposes to construct gas works in every Mexican city that has a population of over 20,000. This grant was contended for by several sets of speculators, and Mr. Whimple says the competition was sharp. There are 52 localities in Mexico that contain the stipulated population.

The offices of the interior department, Washington, D. C., are supposed to be illuminated by incandescent electric lamps, but a chief of division in the General Land Office section, having found that the lamps in proximity to the cases containing the records were not adequate to the duty imposed on them, and that the clerks were in consequence not able to examine the papers, ordered the gas to be again turned on.

The Schuyler Electric Light Company, Hartford, Conn., notified its consumers that, beginning with daylight of yesterday, the current would thereafter be shut off from the incandescence lamp circuit "after sunrise and until early dusk." The Company insists that an all-day service is too unprofitable. Suppose the Hartford Gas Company issued such an edict. Phew!

Mr. Watkins in a New Role.—The following report of the result of the annual election of the Chicago Edison Company shows the ex-President of the Chicago Gas Light and Coke Company in a new role. The executives chosen were: Directors, Messrs. E. T. Watkins, R. T. Lincoln, John B. Drake, R. C. Clowry, E. M. Phelps, J. W. Doane, B. L. Smith, E. L. Brewster, A. A. Sprague, A. F. Seeberger, and F. S. Gorton. President, E. T. Watkins; Secretary and Treasurer, F. S. Gorton. Gas men who know Mr. Watkins will readily comprehend the fact that President Watkins will be no figurehead in the management of this Company.

Alderman Wetherell, of Chicago, has been experimenting with an oil lamp, placed in front of his household, with the object of determining what percentage of profit the people who have contracts for public lighting by oil are reaping. The contract rate is $20 per lamp per annum, and the experimenter declares that means a profit of at least $6 per lamp per annum to the contractors; for such was the teaching of his experiment—"carried out on a fair basis." He therefore urges the city to maintain the oil lamps on municipal account; and not only so, but he further insists that this plan should be so enlarged as to provide for the substitution of oil lamps for the gas lamps now in service. He figures out an annual saving under this plan—each gas lamp costs $24 per annum—of $100,000, and then complacently adds that the saving might be directed to securing an increased arc lighting service for the city. Mr. Wetherell's attention is respectfully called to the invention of Miss Proctor, his fellow-townswomen; between them they ought to accomplish much for the amelioration of public lighting in Chicago.

Here is the latest from General Hickenlooper, in the shape of a letter addressed to Mr. Jas. W. McLaughlin, who is the architect in charge of the erection of the Johnston Building, Cincinnati. The General says:

"Dear Sir:—I suppose it is hardly necessary for me to call your special attention to the growing demand in this city for gas to be used as fuel, and yet you are not in as favorable a position as I am to observe and note the wonderful change in public sentiment on this particular subject. In my judgment we are but entering upon this new era in which gas will be the exclusive fuel for domestic purposes, and that it is essential to perfection in architect's plans that ample provision should be made for it. To insure the greatest economy and efficiency it is important that a full supply be delivered at the point of utilization. This full supply may not always be required, but that may be governed by the simple turning of the stop-cock, still, when a full supply is needed the service pipes should be of sufficient size to enable it to be obtained. Heretofore it has been the practice to require the largest size of service pipe at the meter or front of the house, gradually diminishing in size toward the kitchen. Under the new uses to which gas is being applied these conditions should be reversed—that is, the main point of view should be to have the full supply extend through to the kitchen ready for the stove attachments to be made. Service pipes should also be laid of large size to the grates, to be capped, if not used, but still where they can be utilized without tearing up the floors back to the main supply. Under existing conditions in almost every instance where a stove is set in a large or medium-sized dwelling we are compelled to run a service line from the front to the rear. This is sometimes quite difficult, frequently unsightly and always more or less expensive. Trusting these suggestions will be received in the spirit in which they are sent, I am, yours truly, A. Hickenlooper, President." Perhaps a hint like this from the gas men in other cities to their leading local architects would not be far out of the way.

Manager Fay has been having a lively time of late in the matter of trespass on the mains of the Denver Gas Company committed by the Denver Tramway Company while the latter was putting down its cable line through Lawrence street. So important and irritating had this trespass become that the Gas Company, in attempting to protect itself, was obliged to bring suit against the defendant, damages being laid at $10,000, in conjunction with a prayer for a perpetual injunction against the plan of cable laying proposed. In the plaint it is alleged that on Dec. 15, 1888 (at a late hour of the night), defendant began the construction of a cable line, the same to run through Lawrence street and Nineteenth street to the city limits, and that the said work is now being prosecuted. That on account of the excavations already and to be made, the gas mains have and will become frozen, and that plaintiff will thus be hindered in the distribution of gas, and in making connection with service pipes to the houses on the Lawrence street main. Further, that defendant threatens to lay its tracks over the gas main, and that such action, together with the fact that the cable cars, when running on such tracks, will extend 16 inches beyond the tracks on either side, will prevent the Gas Company from reaching its gas main, and thus interfere with the making of connections, and endanger the lives of its workmen." We hope to report the finding in this case.

A queer case recently occupied the attention of the Fourth Department, General Term, Supreme Court, this State, who dismissed the case.

It appears that Ida M. Paul as administratrix of the estate of her deceased husband, Matthew M. Paul, instituted an action against the Travelers' Insurance Company to recover an accident policy of $3,000, issued by defendant on Paul's life, prior to a railway journey taken by him early in March, 1886. Paul, who was in poor bodily health, died during this journey, and on board the train, from the effects of inhaling carbonic oxide gas that had escaped into the sleeper from the stove by which it was heated. One clause in the policy contained the provision that the insurer was not responsible for the death of the insured by his having "taken poison, nor from contact with poisonous substances, nor the inhaling of gas"—the exemption to hold good whether or not this "taking, contact or inhalation" happened from purely accidental cause. The Company submitted the wording of the policy in its defense, while plaintiff urged that the word "gas" in the policy was to be construed as referring solely to illuminating gas. As intimated above, the Court sustained the Company.

STATE INSPECTOR HINMAN reports that the Fall River (Mass.) Gas Company is not furnishing a gas in conformity with the statutory requirement.

WE are grieved to note the death of Mr. C. C. Bills (on Jan. 14), for some years a Director in the Waltham (Mass.) Gas Light Company. On the 24th of January the Board met and passed the following minute respecting the worth of deceased:

"*Resolved*, That in the death of Mr. Bills the Waltham Gas Light Company loses a faithful and earnest officer, conscientious and equitable in his duties, rarely absent from his seat at the Board; one who for the few years he has worked with us has been a wise counselor and pleasant companion, endearing himself to us alike by the courtesy, earnestness, and genial manner he always brought to this Company of Directors."

WE note a recent sale of Concord (N. H.) gas at $95 per share, on a par valualion of $50.

AT the annual meeting of the Mutual Gas Light Company, Savannah, Ga., the following officers were elected: Directors, Capt. H. Blun, Col. J. H. Estill, J. A. Douglas, M. A. Cohen, G. Eckstein, L. Adler, D. Douglas, Geo. Philler, Thos. Dolan, R. Morgan, A. C. Humphreys, S. T. Bodine, etc. Capt. Blun was re-elected President. It was decided to pass the current dividend, but President Blun said that any local holders who did not care to retain their stock could dispose of the same at par to the parent company, the United Gas Improvement Company of Philadelphia.

As intimated before, Mr. W. B. Miller has resigned the Superintendency of the Aurora (Ills.) Gas Light Company, and Mr. H. T. Gerould, formerly in charge at Mendota (Ills.) takes Mr. Miller's place. The Aurora Company secured a good man.

PRESIDENT SPENCER, of the Monmouth (Ills.) Gas Company, has authorized Supt. Berges to inform the consumers that, beginning with first inst., the gross rate is to rule at $2.25 per M., the discounts (in consideration of prompt payment) showing the net figures to be:

Monthly Consumption.	Net Rate.
The first 1,000 cu. ft.	$2.00
All over 1,000 "	1.75

This is a liberal schedule for Monmouth.

ONEIDA (N. Y.). at a special election held a week or so ago, decided to expend an additional $3,000 for electric street lighting.

SOME months ago we had occasion to mention the nature of the work that was to be undertaken by the Gas Inspector for Lincoln, Nebraska, and it was then hinted that neither he nor his horse would enjoy a sinecure, provided the department rules were lived up to. Mr. Jas. McGraw secured the appointment, and from all that we can learn he has attempted faithfully to carry out his duties, in a way that, while it should be fair to the taxpayers, would not be oppressive to the lighting contractors. In the very nature of things, it could not be expected that the "average" citizen—for there is a good many of him in Lincoln—would praise the Inspector; but Mr. McGraw appears to have been made a special target for the disgruntled. Newspapers and citizens have joined in the assault, until the worm turned at last. The Inspector routed his assailants by extending to them an invitation to accompany him on his round, which entails the nightly inspection of 547 public lights. In regard to the charge that he does not inform himself constantly as to the candle power of the city gas, which the citizen asserts is very far below the standard, he replies that on no occasion has he found it below standard (14 candles), but that it often exceeds 21 candles. He also suggests that some of his defamers are evidently unable to make a distinction between horse power and candle power, since some of them are under the delusion that it is customary to measure illumination by horse power. We knew that that Inspector would have to earn his salary.

PROF. ELY'S attention is respectfully called to the way in which the authorities of Santa Cruz, Cal., figure out the cost of municipal arc lighting, as operated in that city. The cost of operating is $450 per month, but as the receipts from commercial users amount to $330, the 42 lights operated on city account only cost the taxpayers $3 each per month. In other words, the commercial user pays a double tax.

ELSEWHERE will be found an "item" to the effect that the authorities of St. Louis, Mo. were "fixing up" an advertisement for the purpose of securing bids for the construction of a municipal gas plant in that city. The ad., as "fixed," is herewith submitted:

"MAYOR'S OFFICE ST. LOUIS, MO., Jan. 22, 1889.

"Pursuant to a joint resolution of the Municipal Assembly of St. Louis, adopted on January 16, 1889, proposals are invited by the undersigned to build, equip and have ready for service on January 1, 1890, or as soon thereafter as practicable, adequate works to supply St. Louis with gas for illuminating, heat and power purposes, and to lease the same to the city of St. Louis for the term of 30 years, at a rate, payable semi-annually, that shall not exceed 6 per centum on the cost of the works and appliances, the city at the end of said term to pay the original cost of said works and appliances and to become the owner thereof.—GEO. W. ALLEN, Mayor."

THE Brooklyn authorities appear to have taken to heart Inspector Spice's suggestion of last fall that 3-foot gas burners were hardly up to the task of supplying illumination to the public thoroughfares. At any rate, they invited bids for public lighting this year on standards, respectively, of 3-ft. and 4-ft. The bids are appended—all night and every night lighting to rule:

Bidding Gas Co.	3-ft. Rate.	4-ft. Rate.
Brooklyn	$19.80	$26.50
Williamsburgh	21.75	27.60
Peoples	22.00	28.24
Citizens	22.00	28.24
Nassau	22.00	28.24
Metropolitan	22.00	28.24

The electric companies want $182.50 for each half-power arc ordered.

Testing Foundations.

The *Building News* says the resistance of the soil to pressure or great loads is generally left to be determined by experience. In the erection of the weighty and lofty structures on the Champ de Mars in Paris, in connection with the forthcoming Exhibition, experiments have been conducted with this object in view, for the purpose of determining the size of foundations. The method adopted was to level a large surface of ground and place four rectangular blocks of cast iron, 1 ft. 8 in. square, so disposed as to form the corners of a square, the distance apart being 11 ft. 8 in. from center to center. These blocks were bridged by girders of T irons, and these were then loaded with the same till a total weight of 143,923 pounds was reached, when a settlement occurred. The pressure on the ground was 7,311 tons per square foot. During the night the settlement increased about ¼ of an inch. The load was increased next day to 209,776 pounds, when some of the corner blocks had sunk out of sight, leaving the girders on the surface of soil. It was found by these experiments that the soil was capable of resisting a load equivalent to 5.43 tons per square foot. When the load reached 7.31 tons settlement took place, and the ground was incapable of supporting a load of 8.14 tons per square foot. In heavy structures a weight of 8 tons per square foot is not unusual; several chimneys at Birmingham, and St. Rollox, at Glasgow, exceed this amount of stress. St. Peter's, at Rome, bears a weight under the dome of nearly 15 tons per square foot, and it is estimated that the piers carrying the dome at St. Paul's London, bear a weight per foot at the base of 17.705 tons per square foot. The very inadequate data furnished in books makes it necessary for the architect and engineer to make experiments when any heavy or lofty structure has to be supported. How many of the central towers and spires of our cathedrals have failed it would be impossible to say, though the examples of Chichester and Ely ought to be warnings.

The Market for Gas Securities.

The only change in city shares worth recording is that manifested by Mutual gas, which, on active inquiry for investment, advanced 2½ points in the bid price. Equitable has a fair value at 112, that price being paid last week at auction for 42 shares. Quite a heavy block of Chicago Gas Light and Coke Company's 5's was disposed of some days ago, and the offering fairly staggered the market. The opening sale was made at 82½, others following at 82⅜, the last being recorded at 82¼. We would not be afraid to venture a trifle on these at that average. The Boston situation, it seems, may be figured out to suit one's fancy; but the plain truth seems to be, as we held all along, until Mr. Barron came out so positively, that the old Boston Company's property is as valuable to itself as to anybody else. The Greenough-Flagg dynasty requires no prop to brace it. Speaking on our own account, we incline to the view that no change is likely to occur just yet.

A summary of the Report of the Massachusetts Gas Commission appears elsewhere, and from its figures one can gain a good idea of the magnitude and stability of the gas industry in the great Bay State. One other striking thing in connection with it is the way in which State and municipal taxes, which increase with each year, add to the cost of distribution. The general outlook is as usual, all in favor of the investor. Messrs. H. M. Pierson and Geo. M. Cole have purchased the Almon Thomas interest in the Plattsburgh (N. Y.) works. This gives them control.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks.

16 Wall St., New York City.

February 4.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	82	82¼
Central	466,000	50	—	—
" Scrip	220,000	—	47	57
Equitable	2,000,000	100	112	115
" Bonds	1,000,000	—	113	115
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	115	118
Mutual	3,500,000	100	98	100
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern	125,000	50	30	—
" Scrip	108,000			
Yonkers		50	90	100
Richmond Co., S. I.	300,000	50	55	60
" Bonds	12,000	—	—	—

Advertisers Index.

GAS ENGINEERS. Page

Jos. R. Thomas, New York City ... 160
Wm. Henry White, New York City ... 154
Wm. Mooney, New York City ... 160
William Gardner, Pittsburgh, Pa ... 160
Fred. Bredel, N. Y. City ... 159

CHEMISTS.

Durand Woodman, Newark, N. J ... 151

PROCESSES.

National Gas Light and Fuel Co., Chicago, Ills. ... 154
Bartlett, Hayward & Co., Baltimore, Md ... 151
Wm. Henry White, N. Y. City ... 154
United Gas Improvement Co., Phila., Pa ... 153
Henry Pratt & Co., Chicago, Ill. ... 162

GAS AND WATER PIPES.

Gloucester Iron Works, Phila., Pa ... 160
Mellert Foundry and Machine Co., Reading, Pa. (John Fox, Selling Agent, N. Y.) ... 160
Ohio Pipe Co., Columbus, Ohio ... 160
M. J. Drummond, New York City ... 160
Wells Rustless Iron Co., New York City ... 160
R. D. Wood & Co., Phila., Pa ... 162
Warren Foundry & Machine Co., New York City ... 160
Donaldson Iron Co., Emaus, Pa ... 160
Dennis Long & Company, Louisville, Ky ... 160

GAS WORKS APPARATUS AND CONSTRUCTION.

James R. Floyd & Sons, New York City ... 163
T. F. Rowland, Greenpoint, L. I ... 163
Delly & Fowler, Phila., Pa ... 163
Kerr Murray Mfg. Co., Fort Wayne, Ind ... 162
Stacey Mfg. Co., Cincinnati, Ohio ... 163
Bartlett, Hayward & Co., Baltimore, Md ... 151
Morris, Tasker & Co., Limited, Phila., Pa ... 153
Davis & Farnum M'f'g Co., Waltham, Mass ... 161
R. D. Wood & Co., Phila., Pa ... 152
Bouton Foundry Co., Chicago, Ills ... 163
Smith & Sayre Manufacturing Co., New York City ... 163
Fred. Bredel, N. Y. City ... 159
United Gas Improvement Co., Phila., Pa ... 153
Henry Pratt & Co., Chicago, Ill. ... 162
National Gas Light and Fuel Co., Chicago, Ills ... 154

RETORTS AND FIREBRICK.

J. H. Gautier & Co., Jersey City, N. J ... 158
B. Kreischer & Sons, New York City ... 158
Adam Weber, New York City ... 158
Laclede Fire Brick Works, St. Louis, Mo ... 158
Brooklyn Retort and Fire Brick Works, Brooklyn, N. Y. ... 158
Borgner & O'Brien, Phila., Pa ... 158
James Gardner, Jr., Pittsburgh, Pa ... 158
Henry Maurer & Son, New York city ... 159
Chicago Retort and Fire Brick Co., Chicago, Ills ... 159
Baltimore Retort and Fire Brick Co., Baltimore ... 158
Oakhill Gas Retort and Fire Brick Co., St. Louis, Mo ... 158
Emil Lenz, New York City ... 158

REGENERATIVE FURNACES.

Bartlett, Hayward & Co., Baltimore, Md ... 151
Fred. Bredel, New York City ... 159
Chicago Retort and Firebrick Co., Chicago, Ills ... 150
Wm. Henry White, N. Y. City ... 154

PURIFYING MATERIAL.

Connelly & Co., New York City ... 155
Friedrich Lux, London, England ... 151
Edgewater Lime Works, Edgewater, N. J ... 151

SCRUBBERS AND CONDENSERS.

G. Shepard Page, New York City ... 120
R. D. Wood & Co., Phila., Pa ... 162

GAS GOVERNORS.

Connelly & Co., New York City ... 155
Fred. Bredel, N. Y. City ... 159
Friedrich Lux, London, England ... 151

TAR AND CARBONIC ACID EXTRACTOR.

Geo. Shepard Page, N. Y. City ... 152

CEMENTS.

C. L. Gerould & Co., Brooklyn, N. Y ... 158
H. W. Johns Manufacturing Co., N. Y. City ... 151

GAS ENRICHERS.

Standard Oil Co., Cleveland, Ohio ... 164

GAS METERS.

Harris, Griffin & Co., Phila., Pa ... 166
American Meter Co., New York and Philadelphia ... 167
The Goodwin Gas Stove and Meter Co., Philadelphia, Pa ... 167
Helme & McIlhenny, Phila., Pa ... 167
D. McDonald & Co. Albany, N. Y ... 6
Nathaniel Tufts, Boston, Mass ... 166

EXHAUSTERS.

P. H. & F. M. Roots, Connersville, Ind ... 150
Smith & Sayre Manufacturing Co., New York City ... 163
Wilbraham Bros., Philadelphia, Pa ... 155
Connelly & Co., New York City ... 155

GAS COALS.

Penn Gas Coal Co., Phila., Pa ... 165
Perkins & Co., New York City ... 164
Newburgh Orrel Coal Co., Baltimore Md ... 165
Despard Coal Co., Baltimore, Md ... 165
Chesapeake and Ohio R.R. Coal Agency, N. Y. City ... 165
Westmoreland Coal Company, Phila., Pa ... 165
Cannelville Coal and Iron Co., Chicago, Ills ... 165

CANNEL COALS.

Perkins & Co., New York City ... 164
J. & W. Wood, New York City ... 164

VALVES.

Ludlow Valve Manufacturing Co., Troy, N. Y ... 156
John McLean, New York City ... 156
Chapman Valve Manufacturing Co., Boston, Mass ... 156
R. D. Wood & Co., Phila., Pa ... 162

GAS ENGINES.

Schleicher, Schumm & Co., Phila., Pa ... 156
Clerk Gas Engine Co., Phila., Pa ... 156

ENGINES AND BOILERS.

Jarvis Engineering Co., Boston, Mass ... 155
Ball Engine Co., Erie, Pa ... 150

GAS LAMPS.

The Siemens-Lungren Co., Philadelphia, Pa ... 161
G. Shepard Page, New York City ... 156
Albo-Carbon Light Co., Newark, N. J ... 155
Standard Gas Lamp Co., Phila., Pa ... 151

PURIFIER SCREENS.

John Cabot, New York City ... 156
Geo. A. Mills, Baltimore, Md ... 156

GAS STOVES.

American Meter Co., New York and Philadelphia ... 157
The Goodwin Gas Stove and Meter Co., Phila. Pa ... 168

STREET LAMPS.

J. G. Miner, Morrisania, New York City ... 118
Bartlett Street Lamp M'f'g Co., New York City ... 150

BURNERS.

C. A. Gefrorer, Phila., Pa ... 164

STEAM BLOWER FOR BURNING BREESE.

H. E. Parson, New York City ... 124

GASHOLDER TANKS.

W. C. Whyte, New York City ... 166
J. P. Whittier, Brooklyn, N. Y ... 151

GASHOLDER PAINT.

H. W. Johns Manufacturing Co., N. Y. City ... 150

COKE CRUSHER.

C. M. Keller, Columbus, Ind ... 165

ELECTRICAL APPARATUS.

Wm. Henry White, N. Y. City ... 154

BOOKS, ETC.

Goodwin's Directory of Gas Light Companies ... 159
King's Treatise ... 160
Scientific Books ... 134
Management of Small Gas Works ... 156
Gas vs. Electricity ... 158
Practical Electric Lighting ... 155
Electric Light Primer ... 155
American Gas Engineer and Superintendents' Handbook ... 166

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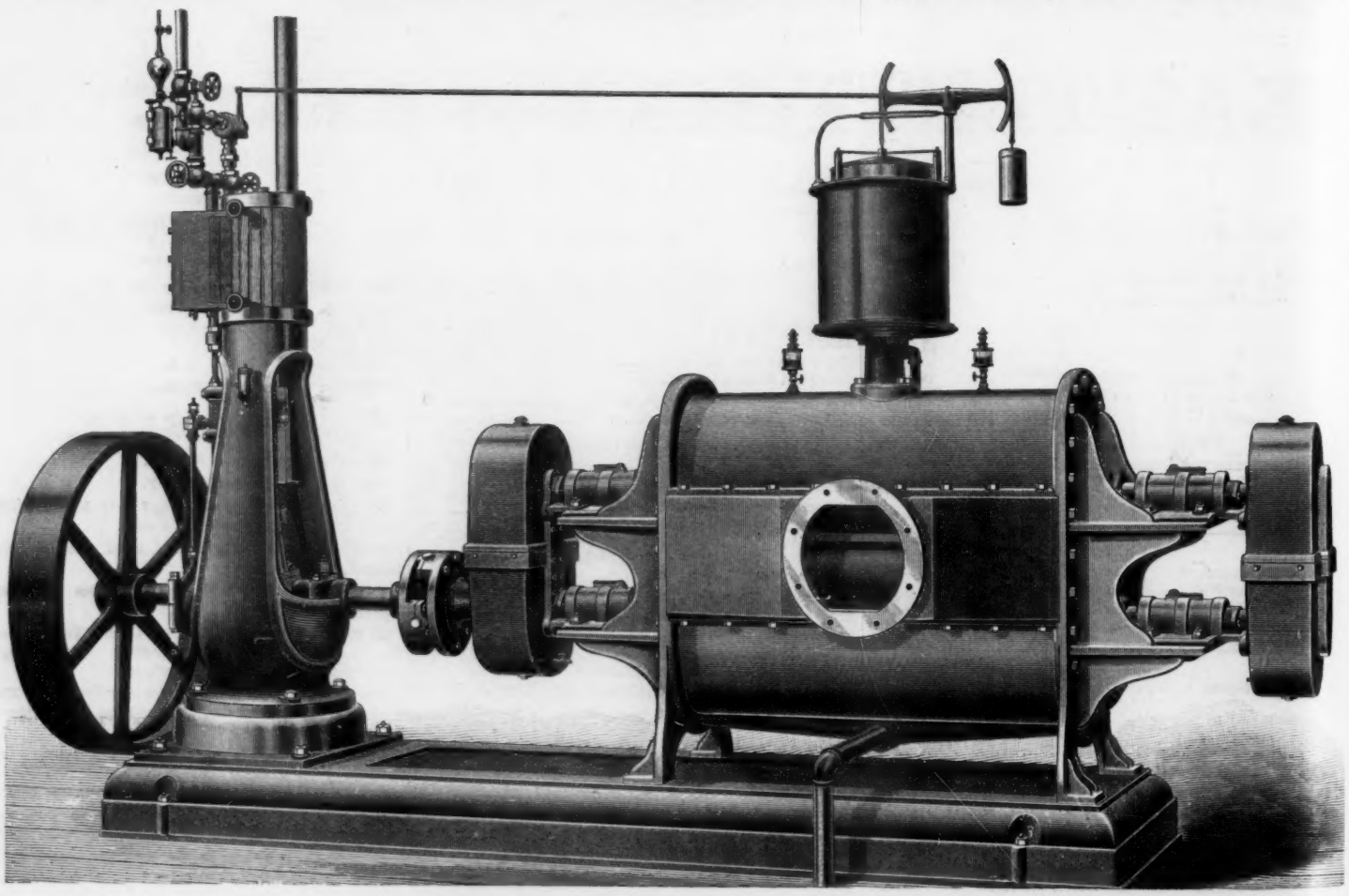

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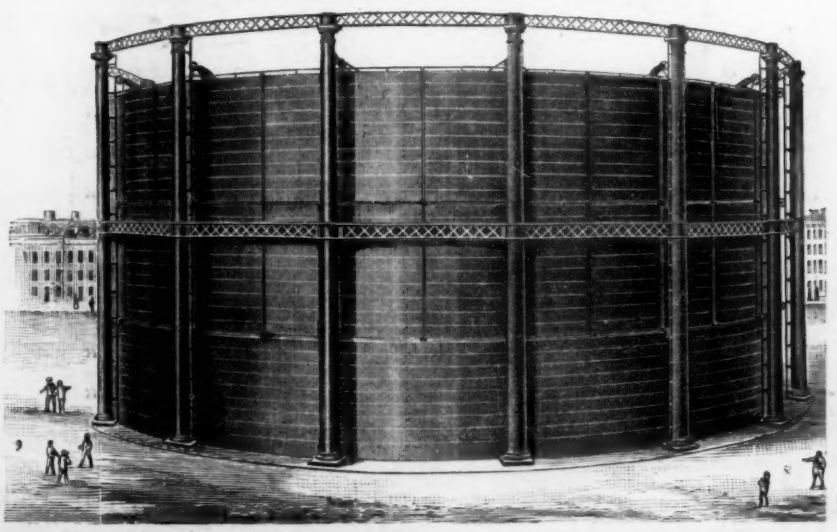

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The following Engineers have personally given permission to refer to them:

G. C. Trewby, Esq., Engineer-in-Chief of the Gas Light and Coke Co., London. The manufacturing plant at Beckton is built in complete sections of 3,000,000 cubic feet capacity each. A Walker Tar Extractor has been fitted to each one of these sections. This was done after a long and thorough trial on one of its sections. The Tar Extractor has been supplied to other works of the Gas Light and Coke Co., including those of which John Methven, Engineer of the Gas Light and Coke Co. at the Nine Elms Station, is in charge. Also to G. E. Stevenson, Peterborough Gas Works; B. Green, Mitcham and Wimbledon Gas Works; W. H. Smith, Bedford Gas Works; F. Linging, Norwich Gas Works; J. T. Browning, Colchester Gas Works; S. B. Darwin, Portsmouth Gas Works; J. McCrae, Dundee Gas Works; W. J. Wells, Stamford Gas Works; J. M. Darwin, Longton Gas Works; J. Paterson, Warrington Gas Works; and J. Coulter, of the Dundalk Gas Works. All of the foregoing gas works are located in Great Britain.

Mr. Charles A. Gerdenier, Superintendent of the Bridgeport (Conn.) Gas Light Company, writes as follows, under date of Dec. 3, 1887:

"The C. & W. Walker Tar and Carbonic Acid Extractor has been in operation at these works for the past six weeks, and is an unqualified success. It removes every particle of Tar from the gas in once passing through the apparatus, and a large percentage of the Carbonic Acid. I also feel quite sure that it prevents the formation and deposit of Naphthaline, because since I started the Washer I have had no stoppages from this cause. These works have been seriously troubled with Tar for many years, and I have used several kinds of apparatus and every expedient which has come to my attention for dealing with the difficulty, but without success. The Walker apparatus occupies comparatively small space, is less expensive than other systems, and requires but little attention. I carry 2½-inch seal, and have an automatic tar delivery valve. This Tar Extractor is indispensable to gas makers."

I have taken the Agency for the United States for this apparatus, and am now prepared to make contracts to erect it on the premises of any Gas Company. It would be manufactured in the following sizes:

No. 1,	50,000	to	100,000	cu.	ft.	per	24	hrs.,	3	ft. square,	5 ft. deep.
No. 2,	"	"	125,000	"	"	"	4	"	"	"	"
No. 3,	"	"	250,000	"	"	"	5	"	"	"	"
No. 4,	"	"	500,000	"	"	"	6	"	"	"	"
No. 5,	"	"	750,000	"	"	"	7	"	"	"	"
No. 6,	"	"	1,000,000	"	"	"	8	"	"	"	"
No. 7,	"	"	1,250,000	"	"	"	9	"	"	"	"
No. 8,	"	"	1,500,000	"	"	"	10	"	"	"	"
No. 9,	"	"	2,000,000	"	"	"	12	"	"	"	"
No. 10,	"	"	3,000,000	"	"	"	15	"	"	"	"

This Tar Extractor will perform its work with about one-fourth the usual back-pressure heretofore required. It is simple in construction, and can be supplied at a very reasonable price—less than any other ever before introduced. Satisfactory results will be guaranteed in every instance.

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Niles Gas Light Co.	Niles, Mich.
Newton Illuminating Co.	Newton, Kansas.
Wellington Light and Heat Co.	Wellington, Kansas.
Chippewa Falls Gas Light Co.	Chippewa Falls, Wis.
Elkhart Gas Light and Coke Co.	Elkhart, Ind.
Madison City Gas Light Co.	Madison, Wis.
South Bend Gas Light Co.	South Bend, Ind.
Sheboygan National Gas Co.	Sheboygan, Wis.
Salina Gas Light Co.	Salina, Kansas.
The Rathbun Co.	Deseronto, Prov. Ont.
Jefferson City Gas Light Co.	Jefferson City, Mo.
Mankato Gas Light Co.	Mankato, Minn.
Minneapolis Gas Light and Coke Co.	Minneapolis, Minn.
Lima Gas Light Co.	Lima, Ohio.
Bellevue Water and Fuel Gas Light Co.	Bellevue, Campbell County, Ky.
Bucyrus Gas Light and Fuel Co.	Bucyrus, Ohio.
Morris Gas Co.	Morris, Ill.
Los Angeles Gas Co.	Los Angeles, Cal.
San Diego Gas Fuel and Electric Lt. Co.	San Diego, Cal.
Jackson National Gas Co.	Jackson, Mich.
Sioux Falls Gas Co.	Sioux Falls, Dak.
Dakota Gas and Fuel Co.	Grand Forks, Dak.
St. Johns Mutual Gas Co.	St. Johns, Mich.
Stillwater Gas Light Co.	Stillwater, Minn.
St. Paul Gas Light Co.	St. Paul, Minn.
Emporia Electric and Gas Light Co.	Emporia, Kas.
Van Wert Gas Light Co.	Van Wert, Ohio.
Lansing Gas Light Co.	Lansing, Mich.
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Rochester Light and Fuel Co.	Rochester, Minn.
Northwestern Gas Light and Coke Co.	Evanston, Ill.
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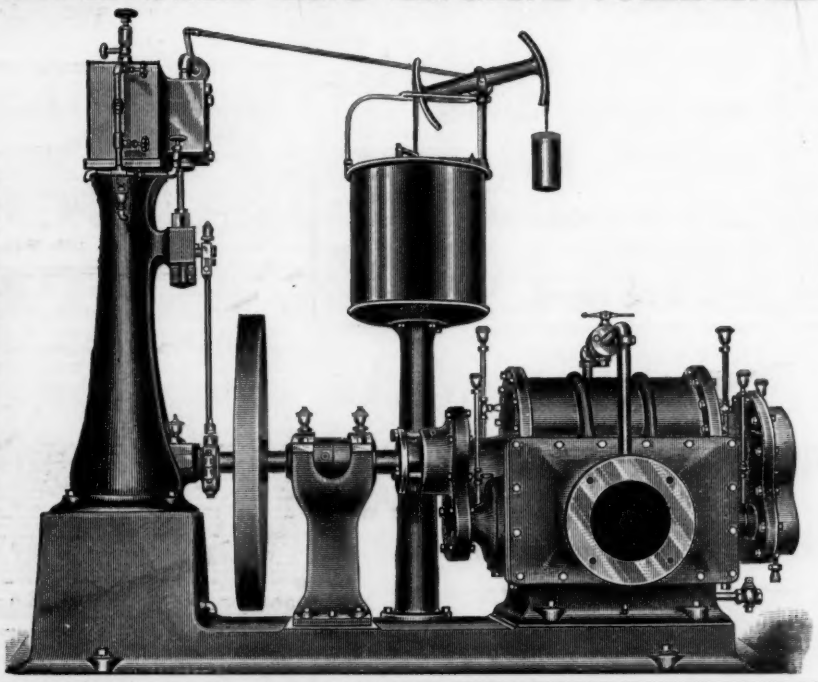

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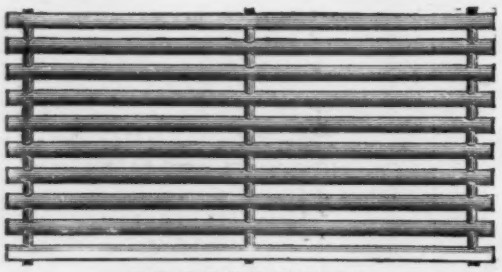

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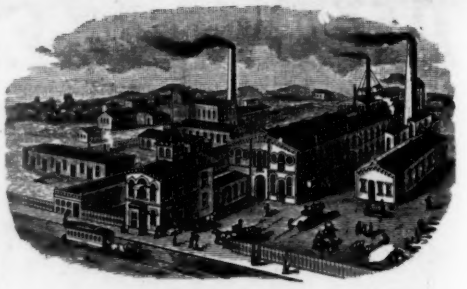

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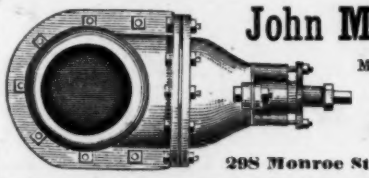

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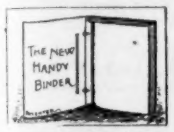

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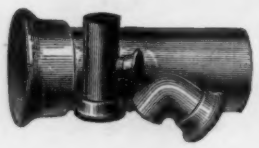

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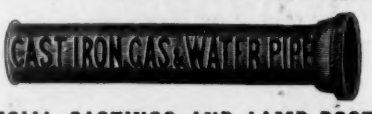

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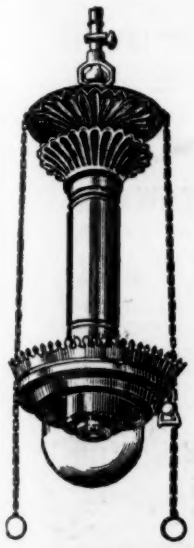

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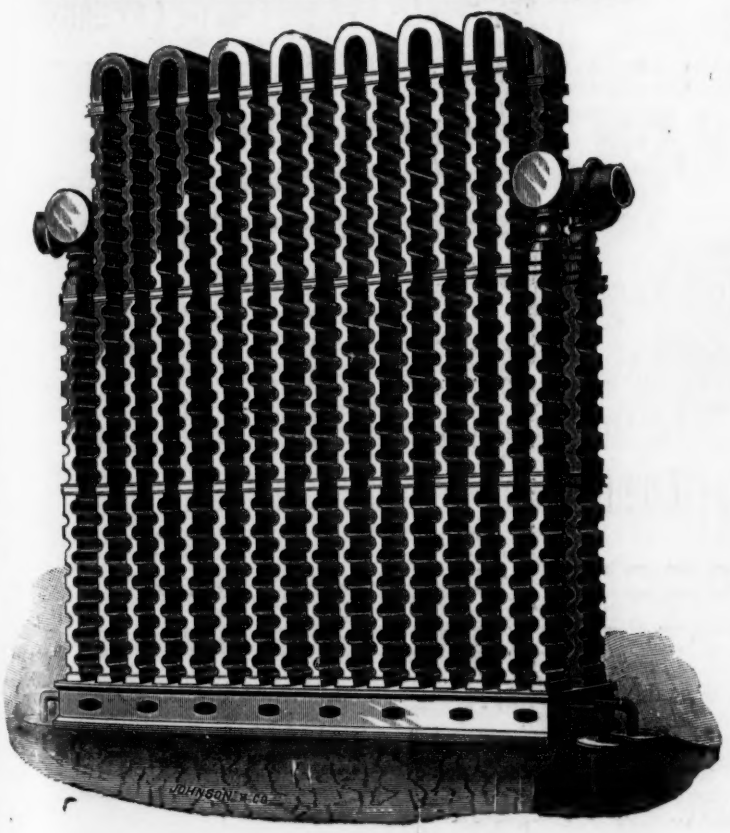

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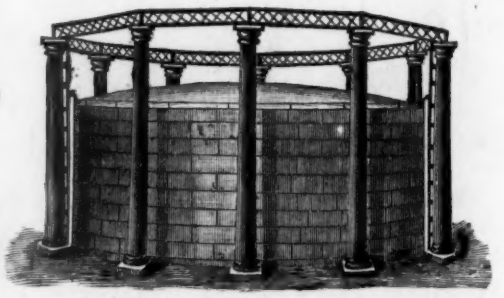

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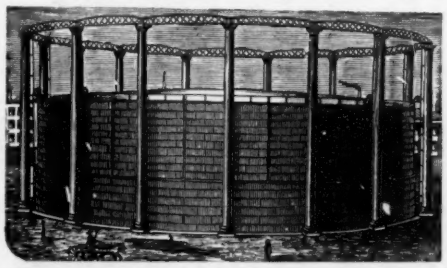
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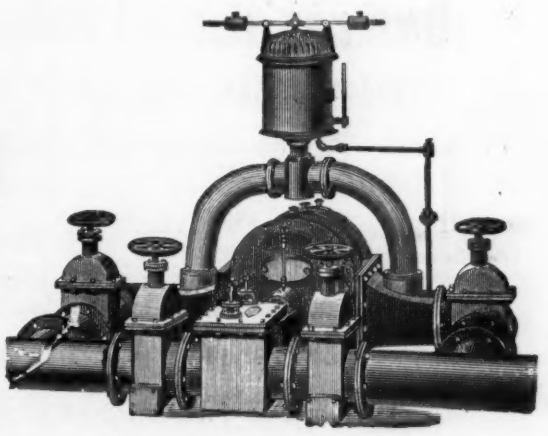

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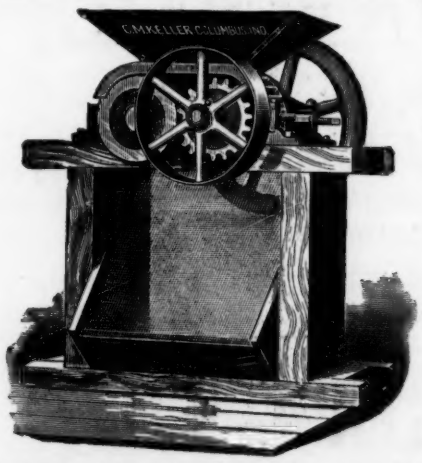

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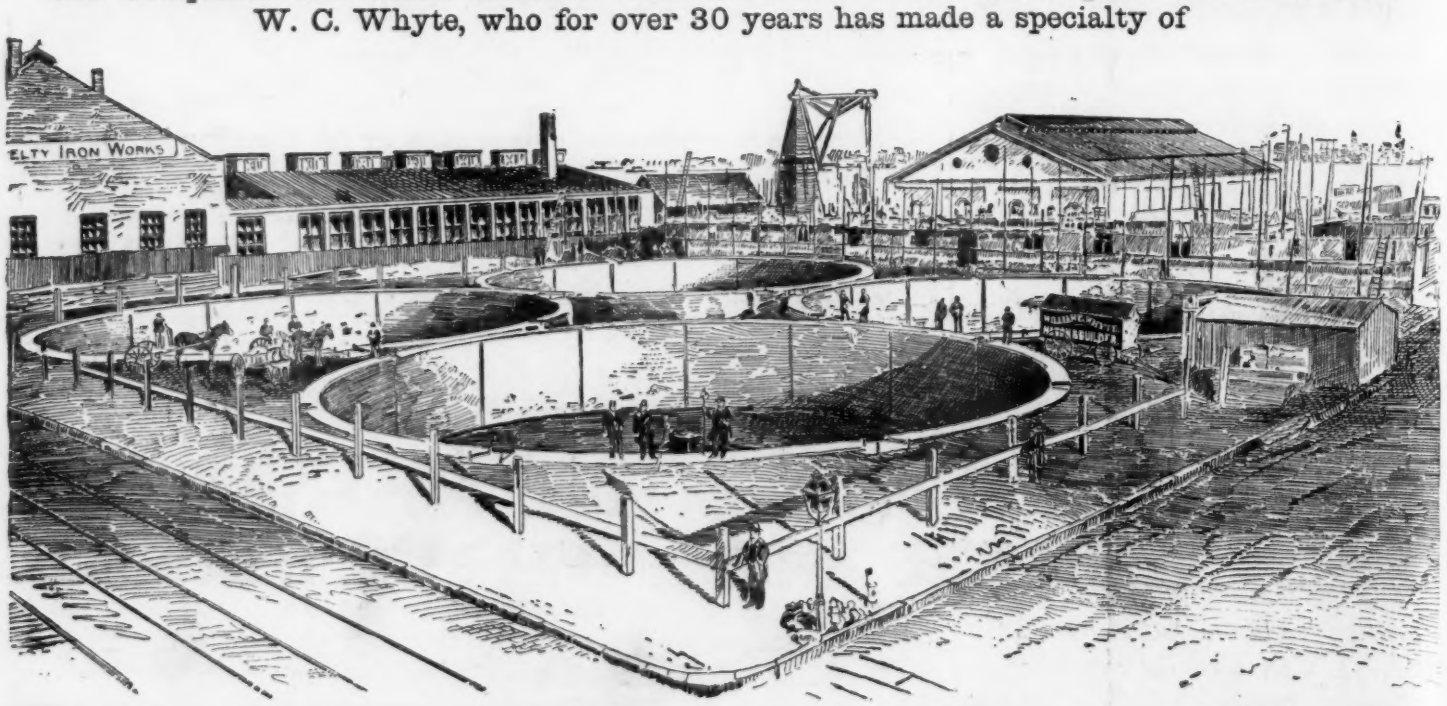

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SIZE.

Stove.	Oven.	Roaster.	Top.	Length over Extension Shelves,
37 in. high.	12 in. high.	12 in. high.	24 in. long.	36 in.
20 in. wide.	17¼ in. wide.	18 in. wide.	21 in. wide.	
	12 in. deep.	13 in. deep.		

This Stove has four burners on top, and double oven burner.

Consumption of gas with all burners in use, 42 feet per hour, at 1 inch pressure.

The top is made in sections, so that a greater variety of cooking utensils may be used. By lifting out the covers and crosspieces and putting in a suitable forked ring, which is sent with each stove, a wash boiler or other large utensil may be set over two burners. Our **No. 87 GRIDDLE** also fits in the same position. The roasting oven is provided with a cast-iron door.

All Fittings are Nickel-Plated.

GAS COOKING STOVE, No. 7 B.

SIZE.

Stove.	Oven.	Roaster.	Top.	Length over Extension Shelves,
31 in. high.	9½ in. high.	10 in. high.	21 in. long.	32 in.
17 in. wide.	14½ in. wide.	15 in. wide.	16 in. wide.	
	12 in. deep.	13 in. deep.		

This Stove has three boiling burners in the Top or Hot Plate, and one single oven burner.

This cut represents our New Style Cooking Stove. As will be seen, it has an ornamented cast-iron Base and Front, and extension shelves. The Oven Burner, which is atmospheric (unless otherwise ordered), is of an entirely new and improved pattern (patent). The ovens are of greater capacity than those of the old style. The Top, in conjunction with the Outlet Pipe, is designed to carry off all the products of combustion, if desired, but they are also supplied with a loose ring which converts it into an ordinary open top stove.

The consumption of this Stove is 35 cubic feet per hour at 1 inch pressure, with all Burners in use.

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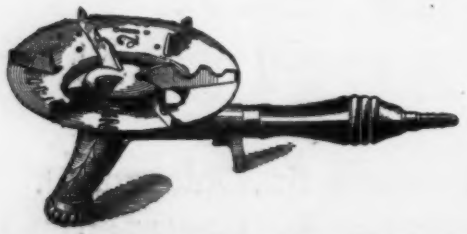

"RADIANT" BOILING STOVE, WITH REGENERATIVE BURNER.

Size, 6¼ inches diameter, 8 inches high. Consumption, 6 feet per hour at 1 in. pressure.

HOT PLATE, No. 111.

Size, 36 in. long, 12 in. wide, with three double burners, 6 taps.

Consumption, with all burners in use, 36 cubic feet per hour, with 1 in. pressure.

¼ in. supply pipe should be used where the pressure is 1 in. or over.